COAL AGE

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"WHAT! give men fields to play in when they have laid your mines idle and are causing you endless expense and anxiety trying to keep places right for them when they do feel inclined to go back to work? Don't you realize that by thus giving them the means of amusing and enjoying themselves, you are just encouraging them to prolong the strike; besides, they ought to be made to understand that if they are going to deliberately and unjustifiably cause the colliery owners such loss, they are up against a stronger power than themselves—a power which will make them sit up for their foolishness."

That is what one manager said, but we thought otherwise. We decided it would pay us to show the friendliest and most generous spirit possible towards our employees; and we concluded that the men would be in better condition and much more able to go through a day's work after the strike was over, if during the stoppage they were spending their time in healthy sports in the green fields instead of hanging around the street corners and running up bills at the public houses.

So we not only gave them fields to play in, but we let them have the horses and ponies for racing, and in addition subscribed prizes for the various sports. It was in this way that we solved the problem of the care of our horseflesh, for the animals were fed, groomed and exercised by the lads with all the care and attention that could be desired in order to get them into good racing condition. Incidentally, of course, when it came to taking them back to the pits, they were in better shape than we had ever seen them.

We also made sure that our reserve stocks of coal would not be raided by giving the usual allowances to all on strike. Our consideration in this respect was rewarded by the men appointing from among themselves, day and night watchmen, who saw that there was no pilfering done by outsiders.

We went further. We thought that if any bitterness did exist, our best policy was to dispel such feelings rather than to aggravate them, so we helped to feed the women and children, and otherwise did what we could to show that our regard for our miners was one of helpful friendship.

What were the results? As soon as the British national strike was declared ended, our men went out of their way to call a mass-meeting, at which a resolution was unanimously passed thanking the management for the generous and considerate way in which everybody had been treated. Our men were among the earliest to return to work, and we loaded what were probably the very first cars to be shipped after the stoppage.

Since then, we have been getting record outputs, and with an entire absence of friction and in the most friendly manner we have been able to arrive at mutually satisfactory settlements in the hundred and one points which have arisen in working under the new Act.

Did our policy pay? Those who know the sort of prices which were obtainable in England after the resumption of work last spring don't ask the question. The far-seeing man who is out to make money knows that the smooth running of his machinery and his labor are equal essentials and he does not forget the human element in the latter.

[*This foreword was written for COAL AGE by an English colliery manager, the facts being based on an actual experience in the recent British coal strike—Editor.*]

Ideas and Suggestions

Interesting Talks Submitted in Response to Our Recent Request for Forewords.

Solving a Low Coal Problem

By Samuel McMahon*

At our 2½-ft. coal seam, Indiana County, Penn., a visit from the general manager was looked forward to with a great deal of pleasure, largely from the fact that an auto ride was usually the outcome of such visits. The animated discussion, on such days, included the usual hard-luck stories about cost of supplies, small output, the more favorable wage scales at adjoining mines, etc., such recitals adding to the keen joy of the occasion.

On this particular day, however, it was different. We were scarcely seated in his office when the storm broke. "Boys, it's a case of mine this seam by electricity or shut it down. We have gone the limit."

For the next couple of minutes I thought only of the mine and the $120 per month I had disdainfully given up, in the Pittsburgh district, together with the possibility of landing the same again.

The idea of successfully mining 2½ ft. of coal with machines had never seriously entered my mind. However, the general manager had more to say, and before he got through with us that night we decided there was a way to try the machines.

When I had left this company three years before, they had an average of 4 ft. of coal all over the mine and were just introducing the machines, but now the high coal had all been mined out, and no working place was higher than 2 ft. 8 in. All that was left to remind us sorrowfully of the high coal was 2 unused motors, 6 Sullivan continuous chain machines, and about one mile of main entry 4½ ft. high at the outside, but gradually tapering to 2½ ft. From this main entry there were butts on both sides from 100 to 1000 ft. in length—all ending up in coal "low and uncutable."

The next morning we had the electrician and his assistant rehabilitating all the paraphernalia pertaining to the machines, and soon started two of them turning 10-ft. room necks, two for each room, one on each rib. The rooms were driven 40 ft. wide, with 24-ft. pillars. We had a sandstone roof and we figured that we would be able to draw these pillars with machines.

The seam being so low, the question of shoveling the coal to the road was a serious one. We placed the tracks 5 ft. from the rib on each side, making the inside rails of both tracks just 24 ft. apart. The maximum distance of shoveling in the rooms was thus reduced to 12 ft., and in the pillars, 17 feet.

There was some prejudice against the machines, so we took picked men to load the coal on a 40c. per ton basis, guaranteeing them $2.56 per day. We also had 1 ft. of bottom to take in the roads, and as we thought the yardage asked was too high, we put this on a basis of 40c. per yd., likewise guaranteeing the man $2.56 per day. As neither of these men ever came under $4 per day, it was only a matter of a couple of weeks until we couldn't make room fast enough for the applicants for both kinds of work.

We found eventually that an ordinary workmen in eight hours could load eight tons of coal, or shoot and clean up eight yards of rock. So, in a short time we had the machines, that were previously idle, running day and night. We paid the machine runners $2.88 and scrapers $2.56, the machines averaging 120 tons per 8-hour shift. Our costs for the month, after the work was started, averaged a fraction less than 50c. per ton.

Our mining rate for pick work was 69c. So after the first month on the new system, our two unused motors were as busy as the other two were the month before, our men were making more money than they could possibly make at pick work and were pleased accordingly.

Our general manager's smile and the auto rides were again in evidence, and, on the whole, the mine and town took a new lease on life, and my chief object in leaving was to inaugurate another system of low-coal mining with the shortwall machine, which I expect to describe in a latter issue.

*Russelton, Penn.

Will the Use of Coal Decline?

By E. N. Zern*

Progress is recorded by ages. Literature, music, the arts, the sciences, all have definite periods, differentiated from each other by "epoch making" advancements in human knowledge and endeavor. Millions of years ago, there existed that geological age in which coal was formed. Today we have again an age of coal, but it is now an industrial, not a geological era.

The terminal marks of the reign of coal are not yet in sight. So the statistician, doting on figures, prophesies that, by the year 1925, we shall be mining 700,000,000 tons of this precious mineral. But unquestionably he must have failed to see the dark clouds gathering on the horizon.

One of these, not alarmingly portentous, is Sir William Ramsay's suggestion to drill holes from the surface to the coal seam and generate gas underground, thus deriving the force from the coal without the drudgery of mining. Since this would vastly increase the power derived from each pound of coal over the present wasteful method, it is a reasonable conclusion that the output would be diminished.

But the investment in coal lands, as such, would not be lost, and perhaps coal would enhance in price as it would increase in value. However, other prophets of changes to come are not giving coal owners such cheerful assurances, for they dream of displacing coal altogether rather than of using it with increased efficiency or of mining it without labor.

The sun mirror, being tested and developed now and for years past, in California, the land of perpetual sunshine, aims to extract the energy directly from the sun, and should it prove successful and sufficient, why burrow after the pent-up energies of eons ago? To paraphrase an old adage, an erg above ground is worth two ergs in the hill.

Another uptodate method of replacing the energy of the past with the wasted horsepower of today is rather more local in its application, but it is typical in that it threatens to rob the coal industry of some of its commanding prestige. An army of men are at this moment erecting a monster wall of concrete to dam the waters of the Cheat River, W. Va., and to husband the 50,000 hp. of energy which in years past has rushed heed-

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lessly down its rocky bed "unwept, unhonored, and unsung"—worse yet as we now regard it—unused.

This will soon be at the beck and call of its conservers, which means that an equivalent amount of coal-energy is to be displaced in the Pittsburgh-Fairmont region. There's a grain of comfort in the enforced consequences of this substitution, however, for a standard coking coal with a $3000 tag on each acre was never meant by Nature to do the menial labor of a steam coal of one-twelfth that value.

But the cloud of the largest dimension, sinister in its blackness, is the new Diesel oil engine. Stock and bondholders may as well become resigned to the inevitable and abandon the coal fields for the tropics, which from henceforth is to become a most prolific source of power. For the Diesel engine is driven by oil—almost any "old oil," mineral or vegetable. We lack the courage to quote more than a part of an article found in a late number of a magazine.

"While the Diesel engine has been highly successful when operated by crude petroleum, it has also been found possible to drive it with almost any variety of oil found anywhere in the world, and the fuel is not fed into a furnace to generate steam, but is used direct.

And it is not, like the motor omnibus, dependent upon petrol. It can be worked with almost any kind of oil; mineral, tar or even castor oil will do at a pinch. Dr. Diesel called my attention to the probable effect of his engine in increasing the value of our tropical possessions.

You may exhaust your coal, you may empty your oil wells, you may cut down your forests, but by the earth-nut, which can be cultivated to an illimitable extent in the tropics, you can draw year by year from the sun an inexhaustible supply of energy and this will never fail you."

"Only the ablest engineers and economists realize the meaning of the tremendous change now imminent in the mechanical world when oil replaces coal as the source of power, heat and light. In the development of the century, it seems likely that tropical regions will be given over to crops of a kind of nut from which oils can be most easily produced. We face the triumph of oil over coal."

All of which shows that estimates for the years 1925 and 1950 must be revised. Also we note that those bilious individuals who preach conservation of coal resources have been exciting us needlessly. The undercutting machine will soon give way to the plow; the ubiquitous darkness of the mines with its baleful dusts and gases will be displaced by the more deadly sunlight of the tropics and the man with the pick and cap transformed into the man with the hoe and sombrero on a South American hacienda or South African farm.

Let the Bureau of Mines coöperate with the Department of Agriculture in investigating the culture of the earth-nut, and I respectfully suggest that editors of coal-mining journals devote a page or two of each issue to a study of the fertility and adaptability of soils.

In this way the passing of the age of coal and the arrival of the age of oil can be made to dawn upon us gradually. What a great impetus to the back-to-the-farm movement it will be when the manufacturer buys a ton of earth-nuts, or a hogshead of castor oil in place of a ton of coal?

And yet, "who knows?" The first ton of anthracite coal shipped to market met with derision. Last year the production was 90,000,000 tons. "Fulton's folly" demonstrated that in spite of the scornful, steam could be made to propel a boat. A few years ago Langley's career came to an untimely close largely because of the ridicule heaped by Washington newspaper correspondents upon his attempts to fly. Yet today we fly. The man who dares draw a line between the feasible and infeasible is apt to defy ancient precedent, and that there is merit and great possibilities in the Diesel oil engine cannot be denied.

However, it is a safe prediction that the transferring of coal lands for hard cash will continue in the same old way.

How to Deal With the Foreigner

By Thomas Hogarth*

By the foreigners, I mean the men with whom real conversation is impossible because they speak a language alien from our own. The temperament of these men varies. You cannot expect to deal with the Southern Italian as you would with a Finlander; the one is as excitable and voluble as the other is incapable of undue emotion.

Some foremen would exclude men of certain nationalities from their mines. I have never felt so disposed. A little patience and study make it possible to understand and succeed in handling them all. There are good and bad to be found from all countries, and to draw a racial line is clearly ridiculous.

It is not well to decide arbitrarily as to what is the best method of dealing with men in general; each case must be treated individually. One thing which we should not forget is that civility becomes every man, and to have a certificate as a mine foreman does not authorize any man to be a browbeater and bulldozer.

It must be humiliating to a man who has just come to this country and who has spent several days or weeks in learning to ask for a job, if when he goes to the mine boss, he gets nervous and says: "Mr. Job give me a Boss." This not infrequently happens, and the boss breaks out in a loud guffaw.

The man does not realize he has made a mistake and thinks he is being made a butt for ridicule. Naturally in his loneliness in a strange land he does not feel drawn to the boss who is guilty of such senseless hilarity. If the boss is humane, he will not take any notice of the blunder, but will give the man a civil answer.

When making your rounds among the miners, do not find fault with everything and everybody. You may scare the foreign workman into a grudging compliance so that he may do what you require. At the same time he does it, not because he sees that it is necessary. He only thinks you want to show your authority by making trouble.

There is a better way. If, for instance, the man has not set his props or if they are wrongly placed, or if you see any danger, stop the workman at once and show him what danger he is in if he continues to work under the hanging rock. Caution him not to be so careless again, or he will be disciplined. Always be careful in his working place, and help him in any way possible.

Many a time I go into a man's place and see him undermining his coal. I do not like the way he handles his pick, or I can see by the way he is sitting or lying that it is fatiguing to him, and he is not getting enough coal for his exertion. I ask him to let me dig a bit for him, and at the same time I show him the proper method.

I always find it best to treat him on a basis as nearly equal as possible. At the same time I like to see him have respect for the mine foreman's authority. If a man is caught doing anything against which he has been warned, I do not neglect to discipline him in some way; he always respects one more for it afterward.

Always call the workman by his own first name; do not label every man John. It's not his name and he does not like your indifference as to his individuality. Always refuse anything he offers you. Make him feel that he is working for his own good and that if he follows the rules he will be justly treated. What you have to tell him say in a kindly way and

*Scalp Level, Penn.

do not on any account show any favoritism.

When you hire a man let him know precisely where he is to work and if he is new to the mines see that he goes along with someone who has been in the workings for some time and understands the customs. Before he goes into the mine be sure to show him the mine law in his own language; and warn him about the danger of touching the trolley wires.

Always pay him all he has earned, and do not take advantage of his being a greenhorn. Let him see that you have an interest in him, and nine times out of ten it will repay you for all your trouble.

I have worked with foreigners of all nations and I have bossed them, so that I understand most of their peculiarities. Give every man a square deal, and as you move about among them at home speak pleasantly to them and show respect to their wives.

If you can help them in any way, do not neglect to do it. If the mine foreman would show a little consideration and treat the foreigners as he would a gang of English-speaking men, they would stay longer in one place and become law-abiding citizens, and the country would be benefited by them to a larger extent than it is at present.

Preparation of Coal

By B. L. Flynn*

To the coal operator who desires to stay in the market, in this day of strenuous competition and low prices, the preparation of the coal is second in importance only to the cost.

By preparation, we mean not only the removal of all foreign matter such as slate, bone, sulphur balls, etc., but also the attention in the mine to see that the coal comes out as large and lumpy as possible.

In districts where mining is not on a screened coal basis, this may be accomplished by a bonus system, the dumper grading the cars as bug-dust, medium lump or good lump and a monthly premium being paid to the one having the greatest number of lump cars on the daily sheets.

The mine boss, by encouraging individual miners to load large lumps, can get his men to take pride in having only large coal. This will soon result in their shooting the coal so as to produce the highest percentage of lump.

The explosive used in breaking the coal down is another item that should be carefully studied and experimented with until the grade best adapted to that particular coal is found. Frequently the coal is loaded in large lumps, but they are so shattered that they will not stand much handling.

The trimming of the car is another item that should be classed with preparation and which should receive considerable attention. A nicely trimmed car is very attractive and calls the purchasers' attention to the fact that preparation is receiving due attention.

The expenditure of one cent per ton may enable the operator to receive several times as much more for his product or at least it will enable him to sell it more readily and consequently keep his mine running full time, during the inevitable slack periods.

We, therefore, find that preparation begins at the coal face before the coal is shot, and ends when it is loaded on the railroad cars nicely trimmed and ready for market.

*General Superintendent, Manitoba Coal Co., Ethel, W. Va.

The Use of Concrete for Brattices

By A. J. Harbaugh*

Where the construction of permanent and tight brattices between the main air courses is required, and where brick is ordinarily used for that purpose, it is better and more economical to use concrete. The aggregate may consist of cement, sand, and either coal slack or ashes, and should be in the proportion of 1:2:6. The saving in transportation to the point of using is considerable, and the cost of the material is less than for a brick wall. As the work is done by common labor, the high cost of the bricklayer is saved, while his helper will about mix and put the concrete into place.

With proper tamping a 9-in. concrete wall will be more nearly air-tight than a brick wall of the same thickness, for it is difficult to get the latter laid up tight enough to prevent air leakage, especially where the fan operates at high pressure.

There is no objection to the use of coal slack and mine dirt as a part of the aggregate because of the practically uniform temperature in the mine. If the concrete were exposed to freezing temperatures, the moisture absorption would cause it to crack and disintegrate, a condition not usually found in the mine.

As the entries are first driven, temporary wood brattices are built. These wood brattices then serve for one side of the form for the concrete, thus requiring a form to be built on one side only. As the concrete sets, the form may be removed from both sides, so that there is always at hand an abundance of lumber for the forms.

When the building of overcasts is required, the side walls are made of concrete in the same manner as for the permanent brattices. The top is then made by erecting an overhead form, on which 10-ft. lengths of wire rope are laid at intervals of 10 in.; this is then covered with a 5-in. layer of concrete, using ashes or gravel.

The wire rope should be so supported that when the concrete is placed in position the rope will be entirely covered. The rope used for this purpose is the rejected and worn out pieces, which are usually plentiful around a shaft or a slope mine and represent very little value. This kind of overcast costs less than half that of brick walls with tee-rail, sheet steel and cement patched top, and is tighter, more durable and less liable to be wrecked by an explosion.

Because of the lower cost, ease of transportation and use of unskilled labor when using concrete, the tendency is to keep the permanent brattices constructed closer to the working faces, thereby forcing a larger quantity of air to the men, and providing more favorable working conditions. Economy of construction also stimulates the more general adoption of overcasts, thus doing away with mine doors, and trappers' wages, and permitting the air to be so directed that the main haulage entries may be free from smoke at all times.

Freedom from smoke contributes to safety and speed in hauling the coal, for both signals and obstructions may be seen at a greater distance. So the use of concrete leads to economy in ventilation, better ventilation, better working conditions for the miners, safer operation and larger output.

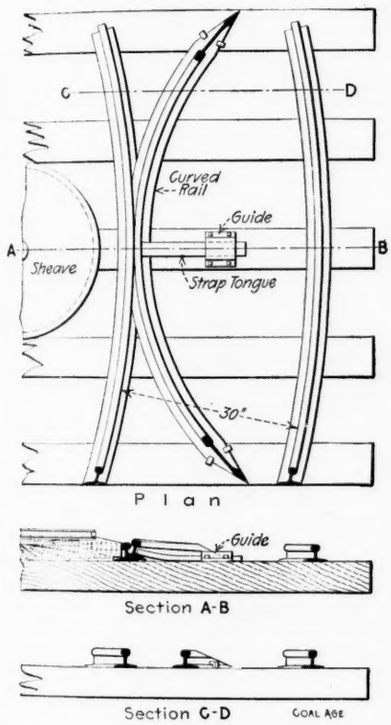
*Mining engineer, Shadyside, Ohio.

Guiding Ropes on Curves

By Joseph Daniels

The following sketch shows a method adopted on a rope incline, which had a great many curves in it, to prevent the rope from catching under the head of the rails and to guide it on the sheaves alongside of the track.

A section of rail, usual weight 30 lb., has its ends tapered to a wedge and is bent into a curve having a middle ordinate of 5 in. in a chord of 6 ft. This rail is placed so that its center touches the main rail at one point and its ends are then spiked to the ties leaving this middle point free to move. A piece of strap iron is fastened to the rail flange at the middle point and slides in a guide which is also spiked to the tie as shown.



Sketch of Guide Arrangement for Use on Curves

The action of this arrangement is as follows: The cars going up or down the incline spring the curved rail away from the point of contact, thus permitting the trip to pass and immediately spring back to place after the last wheel flange has passed.

The rope at this time is approximately in the middle of the track, but its tendency will be to slide over toward the short cord of the adjacent curve. In doing so it is carried from the middle of the track over the wedge point of the curved rail past the main rail to the sheave. In this way the rope is prevented from getting underneath the head of the main track rail.

The Manufacture of Briquettes

A briquette is nothing more than a mixture of coal dust and some binding material, which has been pressed in a mold. This coal dust is usually known as slack and is the result of rough handling of coal in the process of mining and transportation, or exposure to the weather.

Much is dependent upon the shape and size of the briquette, if good air circulation and thorough combustion are desired. In Europe, briquettes are often made in large square shapes for compactness in storage. This shape is inconvenient, since the briquette must be broken up before firing. Another popular shape is prismatic with rounded edges. This form insures good circulation and less waste in breakage, but it is wasteful in space and makes ignition somewhat more difficult. Other shapes, too numerous to mention, are on the market, each different shape affecting in some way the draft through the coal bed and the rapidity of ignition.

Probably the most important characteristic of a good briquette is coherence. Ordinarily a briquette should not lose more than 5 per cent. in dust and breakage involved in its use. A table is given below which shows how the percentage cohesion varies with the percentage of pitch used and with the pressure. These results were obtained by M. Wery of Paris with a Biétrix machine and were printed by the U. S. Bureau of Mines.

SHOWING HOW THE PERCENTAGE COHESION VARIES

Pressure in lb. per sq. in.	Per cent. of pitch used	Per cent. of cohesion obtained
1844	6	25
2695	6	46
3831	6	61
1884	7	52
2695	7	70
3547	7	74

The main problem in briquetting is to find a suitable binding material at a cost sufficiently low. It has been estimated that the cost of manufacture per ton of briquettes in the United States varies from 25 to 50c. Let us suppose now that the difference between the price of lump coal and slack is $1. It is evident then that the binder must cost less than 50 or 75c. per ton, in order to make the business profitable. In choosing a binder, therefore, it will be well to remember the following precautions:

It must be sufficiently cheap to make the manufacture of briquettes profitable.

It must bind strongly, producing hardness with a minimum brittleness.

It must hold the briquette together satisfactorily in the fire.

It must produce a briquette sufficiently water-proof to stand conditions of its use.

It should not cause smoke or foul and corrosive gases.

It should not increase the percentage of ash or clinkers.

It should not decrease the heat units obtainable from the given weight of fuel.

It is estimated that the cost of manufacturing briquettes with a German plant, provided that the plant is located at the mine, is approximately $1.35 per ton. Assuming the plant turns out 50 tons per day, that it employs two shifts of 10 hours each, the U. S. Bureau of Mines has figured the following table of expense for one day's running:

COST OF MANUFACTURE

1. Labor for two shifts of 10 hr. each:	
(a) one superintendent at $3 per day	$ 3
(b) two machine operators at $2.50 per 10 hr.	5
(c) eight laborers at $2 per 10 hr.	16
	$24
2. Depreciation and maintenance (per ton of briquettes, 32c.)	16
3. Interest on investments (30c. per ton of briquettes.)	15
4. Power (variable according to locality)	3
Total	$58

This makes the cost of manufacture per ton of briquettes produced $1.16.

A Spanish Syndicate

Special Correspondence

The special committee, organized in Madrid by the Spanish coal owners, has drawn up certain bases and regulations for the creation of a National Coal Sales Bureau, and is circulating them among the coal producers for their consideration. Any suggested alterations will be considered by the National Coal Mines Association after Sept. 30.

It is believed that such a bureau will make it its business to bring the producer and consumer together and thus obviate the unjustifiable changes in price of mineral fuel, the monopolizing of the article, competition among producers and the unfair profits of speculators. Furthermore, the bureau is expected to favor the development of the mining industry through this organization and hopes to increase the production in proportion to the needs and capacity of the market. It will try to supplant, as far as possible, foreign coal, which is consumed in the country.

This society is to last five years, from Jan. 1, 1913, to Jan. 1, 1918. In order to become a member a subscription must be lodged as a guarantee of faithful compliance with the conditions of the syndicate. For the purposes of organization, Spain will be divided into five districts, namely, Asturias, Leon y Palencia, Cordoba y Sevilla, Ciudad Roel and Aragin y Cataluna. Each will have a district committee. The members of these five committees, with some assistant councillors for the Asturias, because of the importance of this coal basin, will constitute the executive committee of the sales bureau, which will be charged with the administration of general business. The offices of the bureau will be in Madrid.

The New Harleigh Breaker

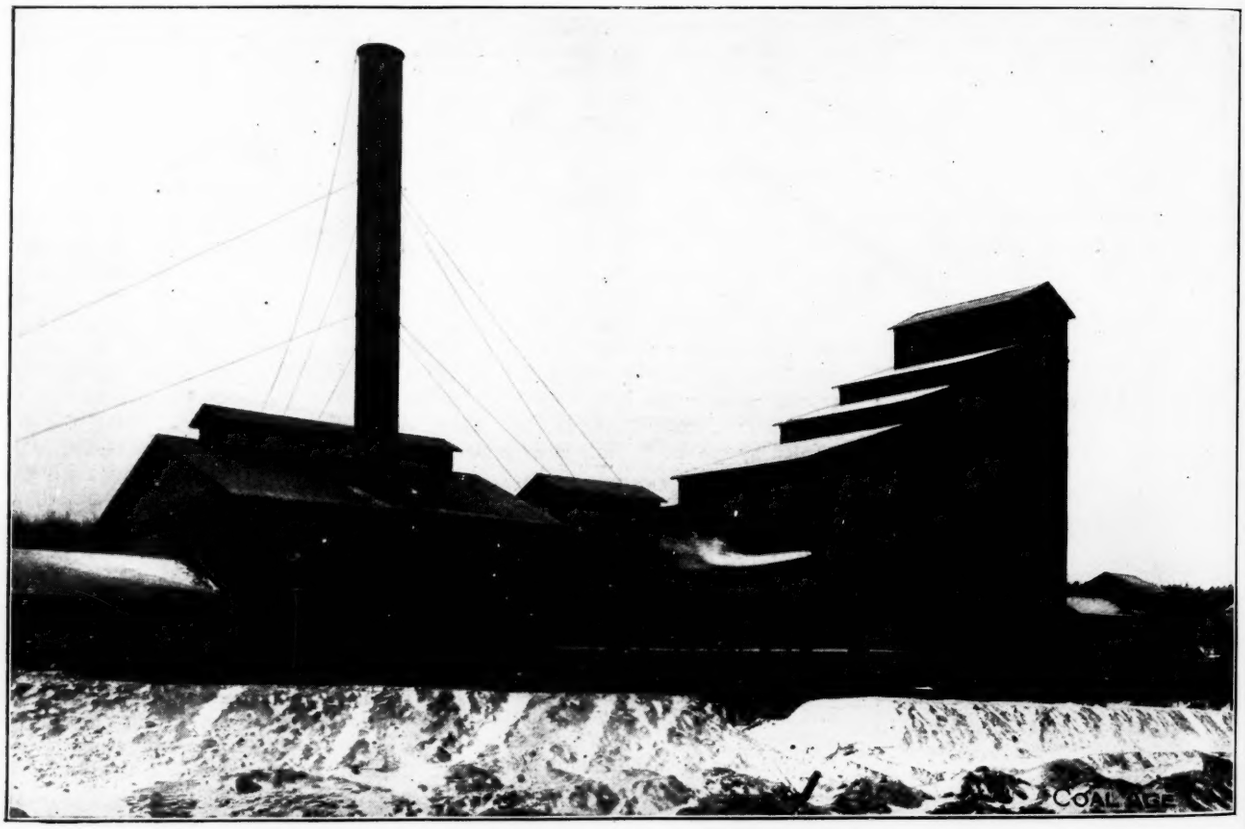
By F. B. Davenport*

The Harleigh breaker is decidedly unique in many respects. All the coal is subjected to a rigid examination in the preparing house before it enters the breaker proper. The idea, in so doing, is to relieve the structure of considerable extra weight of rock and slate which can be separated at the start.

*Welles Building, Wilkes-Barre, Penn.

At Harleigh, just north of the city limits of Hazleton, Penn., is located the new breaker of the G. B. Markle Company, of Jeddo. This new plant has been erected for the purpose of handling the coal from the Markle strippings, and coal from the southern end of their property, previously mined from an old abandoned plant located near the site.

An enormous stripping extending several hundred feet deep and over a mile in length affords an opportunity to reclaim most of the coal lost through the former operation when that plant was flooded. The Mammoth vein and several other large veins are mined. Eight large steam shovels and some fifteen or twenty locomotives work on the coal and surface material. The Mammoth vein is handled through stripping operation, the other veins through mining operations only.



OUTSIDE VIEW OF THE HARLEIGH BREAKER

General Description

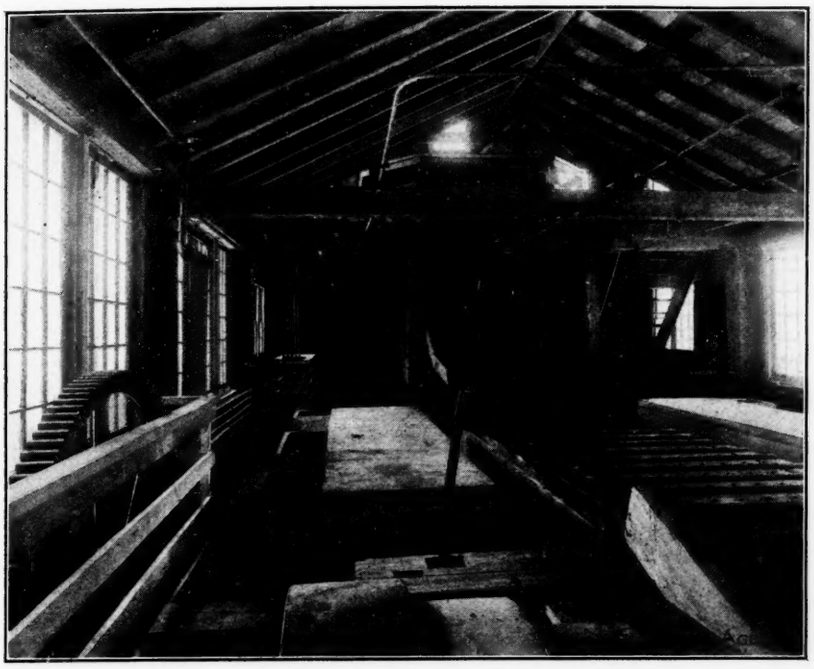
The plant is decidedly unique in many respects, especially in regard to the preliminary handling of mined and stripping coal, and the general construction of the whole plant.

All the coal is dumped into a concrete hopper and fed into a large conveyor line and then carried to what is known as the preparing house, joining the breaker proper, but only about 25 ft. in height. Here the larger size coal is subjected to a rigid examination and the rock and slate separated from it, while the coal, after passing over the travelling platform, is crushed and broken.

The idea of this preliminary separation is to do this work on the ground and thus relieve the breaker of this extra height and weight. Also, it is thought more economical to save as many large pieces of bony coal, rock, etc., from going to the rolls, thus reducing the number of mechanical pickers, jigs, etc.; that is, to get out as much of this large doubtful stuff as is possible while it is large. Hence much emphasis has been put on this part of the plant and every method used to facilitate this idea; such as, easy working position for the men, plenty of room, plenty of light, best refuse disposition, best arrangement of units, etc., etc. How well this preliminary preparing idea has worked out is shown in the idea of the breaker, for the distance from the top of the walls to the top elevator discharge is only 98 ft. 8 in.

A yellow pine structure was used throughout and each stick, after being framed, was dipped into boiling hot creosote before it was put in place. All the foundation walls, piers, boots, hoppers, etc., are of concrete. A liberal number of large windows, pivoted top and bottom, was used so that light is ample.

The plant is located along the Lehigh Valley tracks and just beyond the outcrop of the veins so as to insure no anxiety by way of settlings from the mined workings. Operations were begun on the foundation in the fall of 1909, though building operations did not begin until the spring of 1910. The work was done by company labor and no attempt was made to rush, so that a thorough plant is the result. Ample time was given for designing the plant. Everything was detailed and no trouble



PREPARING HOUSE

was experienced after building operations began.

LAY-OUT OF MACHINERY

The coal is brought to the plant in mine cars and stripping cars, dumped into a common hopper and fed into a 12x48-in. Keystone straight-line conveyor, which carries everything to the bars in the preparing house. Lump and steamboat sizes go over the bars on to the 5x25-ft. travelling platform for inspection, while the fine stuff goes direct to the elevator and is called the mined coal so as to distinguish it from the clean coal. The lump and steamboat coal separated here is immediately broken down through a slow speed 40x36-in. roll.

The rock pocket is located directly under the floor of this building and is of ample size to hold and load conveniently a large quantity of rock, so that this heavy rock is immediately eliminated from the cleaning process.

Alley-ways, tables, etc., are built flush with the picking tables so that no large pieces are lifted but can be slid or pushed by the men onto these separate tables where others attend to the inspection and separation. The coal is then elevated by two elevators to the top of the breaker where it is discharged onto two sets of 6x16 ft. shakers, which make broken and egg coal sizes. The broken coal is then discharged onto picking chutes, inspected, picked, and ground to egg coal and smaller sizes, through the upper monkey rolls, which are 30x30 in. These are the only rolls in the breaker proper. The egg coal from this 6x16-ft. screen goes direct to the egg coal hopper in front of the jigs.

THE SHAKER SCREENS

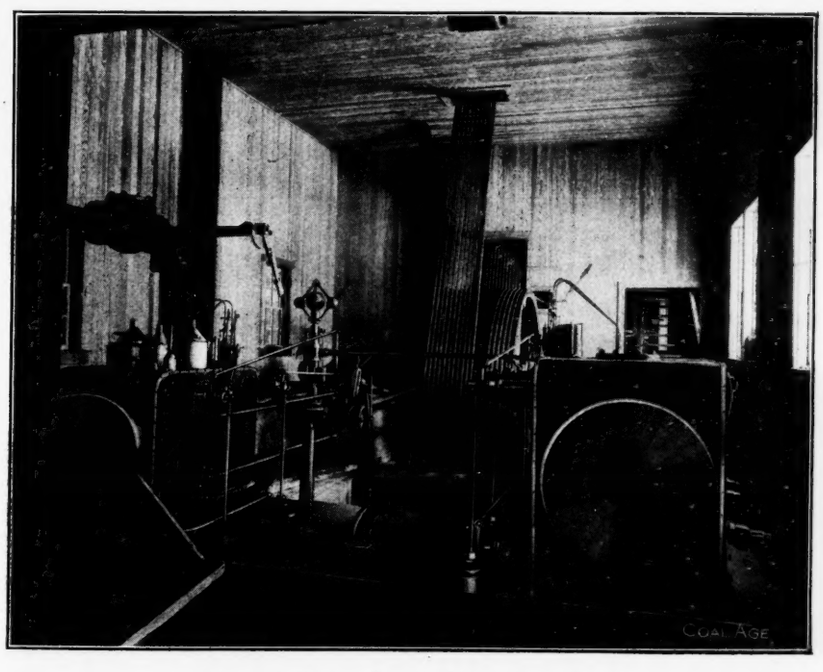
The shakers are placed parallel; that is, two sets of broken and egg coal shakers, two sets of stove, nut and pea, and two sets of buckwheat, rice and barley Nos. 1 and 2, with room for additional sets of stove, nut, pea, buckwheat, rice and barley screens. These can be installed, should the mined coal be increased to such an extent that the present screens could not handle it; for under the present arrangement the outside sets are reserved for the clean coal, which is made through the upper set of Monkey rolls, while the inside set of screens take the mined coal from the upper set of broken and egg coal shakers. With an increased output the additional screens can be installed without any trouble, for the jig capacity is ample, and as the cleaned coal is not run through the jigs their capacity is governed only by the mined coal from the inside set of screens.

After the cleaned coal is sized and discharged from the screens the various sizes are run to a convenient point where inspection is possible, if necessary, and then goes direct to the main coal pockets. The prepared coal from the inside or mined screen goes to the hoppers ahead of the jigs.

BELT-DRIVEN JIGS

When these hoppers were constructed it was thought best to change the style of the jig which was in use from an individual engine-driven jig to a common line-shaft jig. In order to do this it was decided to regulate the feed rather than the speed of the jig for a given result, also to install these hoppers between the jigs and the screens, to provide for a regular supply of coal to the jigs and to form a receiver for the coal in case of accident to any single jig. Thus, in the event of failure of a jig, it would not be necessary to shut down the whole plant until it was repaired, or to rush another jig on this size coal. The hoppers have a capacity of at least one hour's run on that size coal.

From the plan of the jigs it is possible to jig and re-jig; that is, two jigs work on coal and a third jig on the slate and rock from these two. The slate from



ENGINE ROOM—CORLISS CROSS-COMPOUND

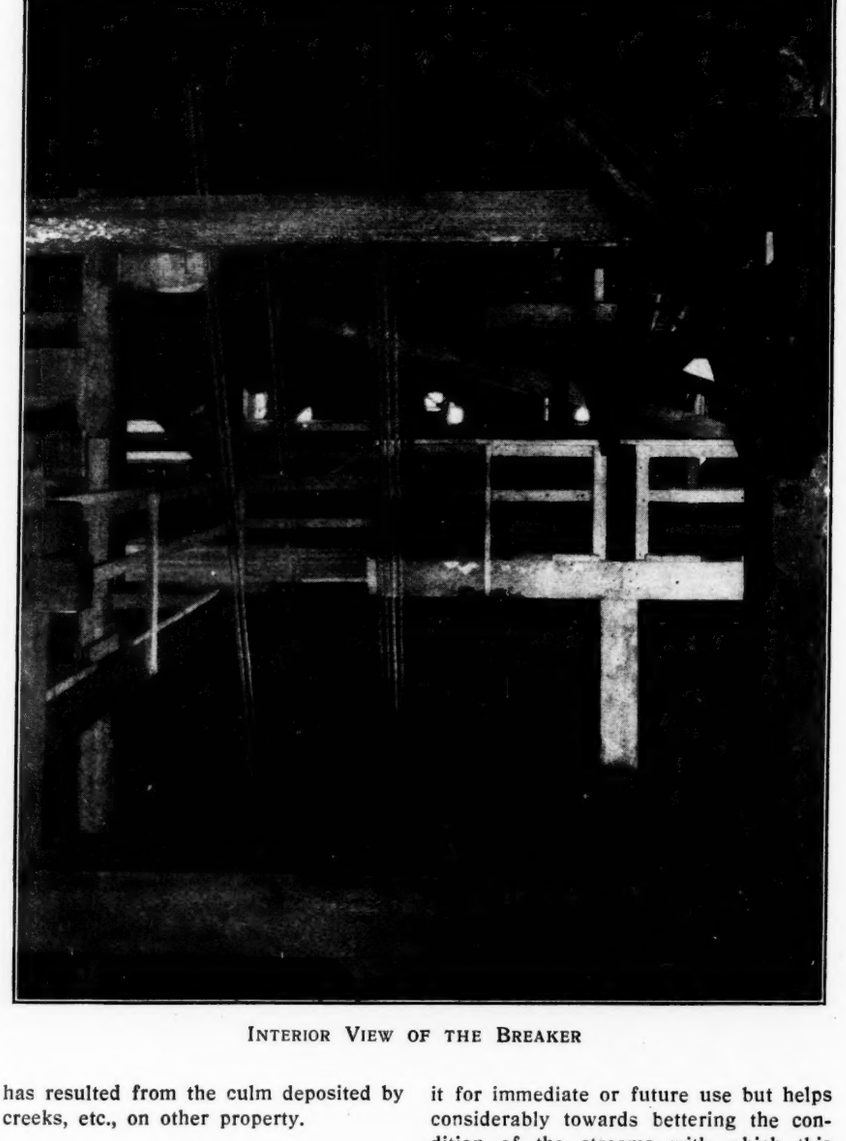
all the jigs, together with the slate from the hand pickers, is collected by a slate conveyor, placed directly in front of the jigs and underneath the picking and inspecting chutes. This 6x12-in. conveyor is raised at the discharge end so as to provide for an inspection or picking chute above the screen-room floor, where it is in sight of the chute boss.

Here two boys inspect all the refuse from the breaker proper and pick out any coal or bony coal which happens in the slate. This slate now goes to the slate hopper and thence to the bank. The coal and bony coal from this slate picking chute goes to the bony coal rolls at the foot of the elevators where it is ground to smaller sizes and then goes to the elevators, together with any bony coal from the other chutes selected by the hand pickers, etc.

Handling the Slush

All the slush from the shaking screens is run to the upper end of the jig slush trough, whence the combination goes to the slush shaker. This is a single deck 6x12 shaker with 1/16-in. mesh plates. All the slush from the breaker is passed over this screen and it acts in the capacity of a check on the coal leakage for the whole breaker. It is surprising what amount of coal this single unit saves. A certain amount of waste is always occurring from blocked chutes, loose screen segments, jigs, pickers, etc., but this is all saved at this screen and reclaimed.

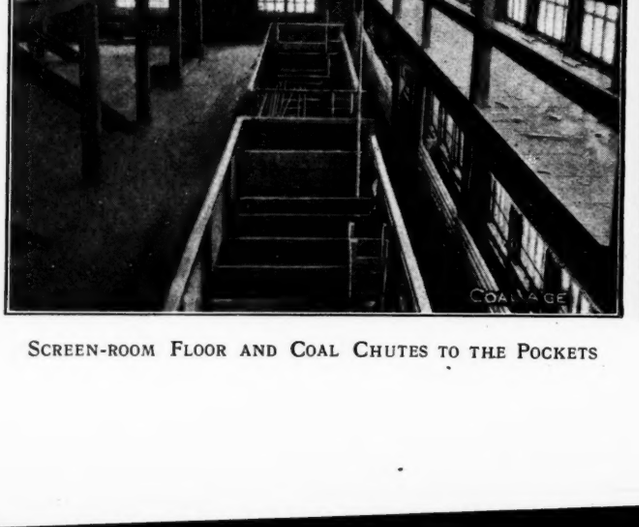
After this slush screening process there is nothing left but pure culm and water, and this is run to the settling tank in a separate building, west of the breaker. This is an exceptionally unique contrivance, designed originally by the Wilmot Engineering Co., Hazleton, Penn., and has saved considerable money. Its chief object is to separate the culm and water. Of late years the disposition of culm has become a serious proposition in some places, due to litigation which has resulted from the culm deposited by creeks, etc., on other property.



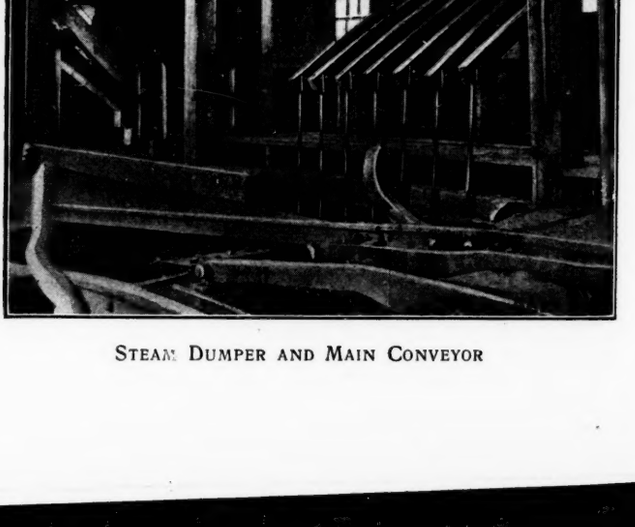
Interior View of the Breaker

The Settling Tank

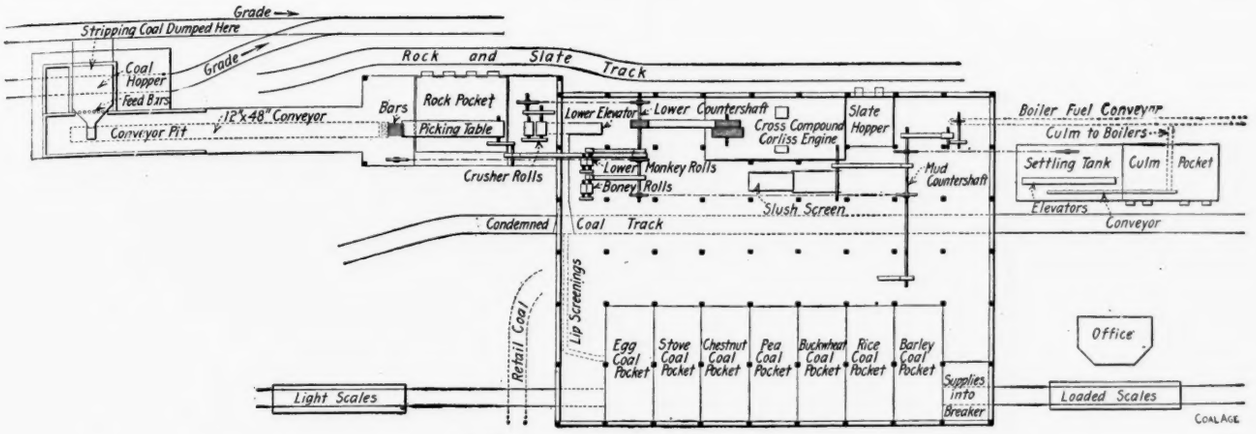
This settling tank acts very well in removing the culm and not only reclaims it for immediate or future use but helps considerably towards bettering the condition of the streams with which this muddy water comes in contact. The culm and water from the slush screen is run into a V-shaped portion of the



Screen-room Floor and Coal Chutes to the Pockets



Steam Dumper and Main Conveyor



PLAN OF THE HARLEIGH BREAKER

tank. A slowly moving elevator line runs at the bottom and parallel with the side of the V-shaped portion of the tank, scooping up the culm which settles and carries it up out of the tank to the first knuckle onto a 45-deg. pitch. The water runs off here, while the culm remains in the bucket. When the line reaches the next knuckle at 90 deg., the culm is dumped out.

This process is continuous and removes the culm as fast as it accumulates and at the same time allows the water to settle whence the culm is taken care of by the elevator line and the surplus water overflows and runs away, dirty, of course, but comparatively free from culm. After the culm is dumped from the elevators it is caught in a scraper line and taken to an elevation sufficient to run it into the boiler fuel conveyor line, or into a pocket built to receive it, from whence it can be loaded in large cars and shipped, or into dump cars and used at other places.

The elevator buckets in this settling tank are not perforated but are solid and depend on a very slow speed to slowly spill the water at the first knuckle, leaving the culm in the bottom of the bucket and at the next knuckle the bucket is completely reversed, depositing the culm into a chute and then into the conveyor line.

THE CONVEYORS

All of the shaker screens are of the Parish flexible-arm pattern, board hung. The main coal conveyor, 12x46 in. flights, which conveys the coal from the dump to the preparing house, is of the Keystone straight-line concealed type, made of rivetelss drop forge links. This is an especially strong conveyor, having a large capacity and featuring an easy drive, due to the construction of the chain. The wear is distributed along the full length of the links instead of on rounded surfaces, which are usually the projections, from the part holding the rivet, and the vital part of any chain.

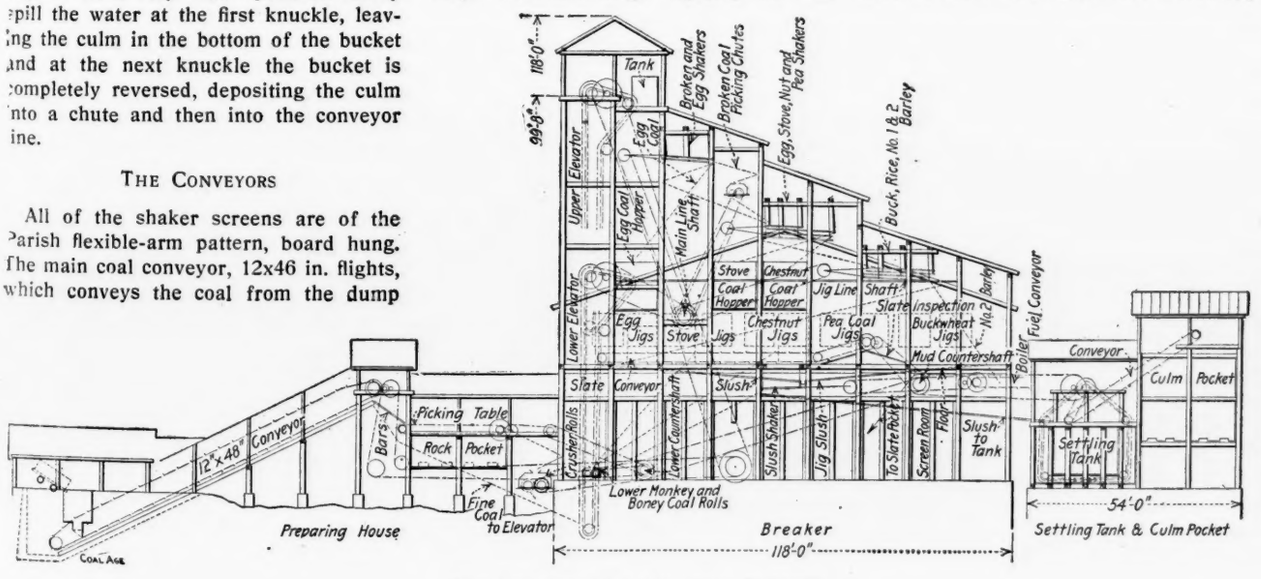
This type of conveyor is 100% capacity of the flight water measurement, besides allowing a 50% overload, without injuring the chain whatever. The chain is protected so that the coal does not ride it, and no trouble is experienced from this source by part of the chain riding the sprocket, although at times it is considerably overloaded.

The weight of the flights is carried on the chain which rides on hard-wood runners, which require no lubrication and at the same time make no noise, for the flight is held suspended about one-eighth of an inch above the pan by means of angle iron attachment. This makes an easy drive and large capacity for the same sizes, and the coal cannot ride the chain.

A stout conveyor was required at this breaker on account of having both mined and stripping coal; for to convey stripping coal loaded by steam shovels is frequently one of the nuisances of a preparation system, because of the exceptionally large lumps which can be loaded.

THE UPPER MONKEY ROLLS

The upper monkey rolls are set to make the largest percentage of egg coal. So as to insure no leakage of broken coal through this roll a nine-foot section is included in the screening area as a check on the work of this roll. The small percentage of broken coal which is passed is saved here and returned. The main rolls at the foot of the elevators are also set to make a large size broken coal—in fact, a little larger than the regular broken coal, for it has been found that a larger amount of other prepared sizes can be expected by doing so while less dirt and finer sizes results. Frequent tests of both rolls show their efficiency



ELEVATION OF THE HARLEIGH BREAKER

and enable any changes in adjustment to be detected.

To evenly balance the fine coal screens, the lower deck was made for preparing a barley-size coal called No. 2 barley. This is an intermediate coal between the regular barley and culm, and is run to the boiler fuel conveyor line which takes it to the boiler house for fuel. If necessary this deck can be made a regular barley size and act as a check to the upper barley deck. By this arrangement the older plates can be used a little longer on the upper deck and make a good size barley coal for shipment while the new plates are used on the bottom deck and this used under the boiler.

The Power Plant

A number of such combinations are possible on this set of shakers to accommodate a particular market. Also, if for any reason a larger size coal is desired in the fire room it can be supplied from these shakers, although the grates and fire-box were especially designed to use very fine material.

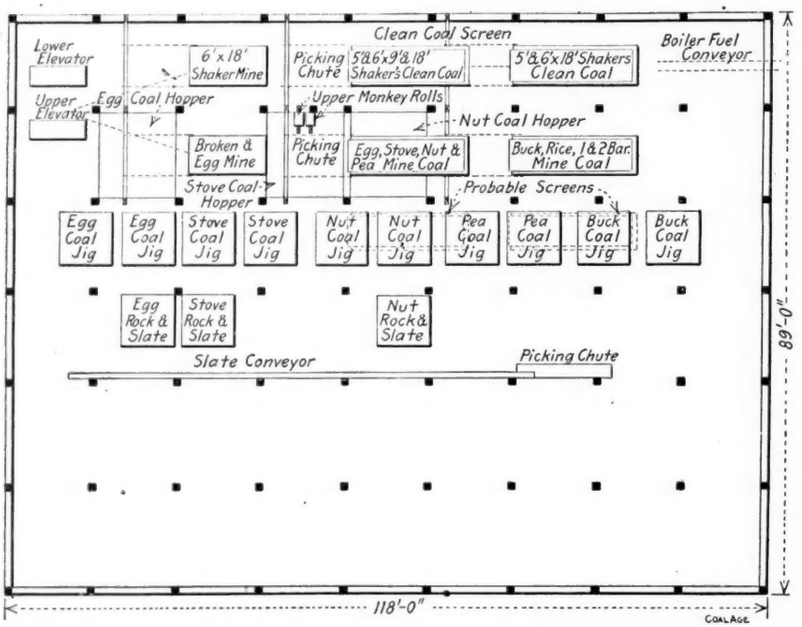
The power plant consists of two 500-hp. Heine boilers. This is far above the actual needs—in fact, one unit is ample to supply the necessary steam to the inside and outside service pump, breaker engine, heating, etc. Thus while one unit is in service the other is open for inspection.

The breaker machinery is driven by a 16-in. and 26-in.x30-in. Corliss cross-compound engine, built by the Vulcan Iron Works, and handles the work very nicely. Rope drives are used throughout, as shown in several of the illustrations.

Exhaust steam from the breaker engine and pumps is utilized for the heating, and the condensate is returned to the feed water heater.

Another feature is the arrangement for inspection and lighting of the main coal pockets. A liberal space has been left open on the screen room floor for this purpose. This does not interfere with the picking chute but exposes the pockets, telegraphs, etc. to view. In the construction of the chutes care has been exercised to so avoid abrupt turns; thus breakage is reduced. Leakage is prevented by making them water-tight. Cast-iron water lines conduct the breaker water to points of service. The plant is electrically lighted from the company's own sub-station in the neighborhood.

The plant was originally designed to run 800 to 1000 tons capacity, and it handles this easily. In fact, it is not uncommon to run through fourteen hundred to fifteen hundred tons daily, without seriously crowding.



Plan above Screen-room Floor

Summary

The plant is remarkably free from vibration, due to the inexcessive height and the fact that the screens are of a good pattern and are run with the long side of the breaker.

At the loading chutes another feature was introduced by making it possible to load steel cars and box cars from the same pocket and on the same track. This was developed by having three loading gates to each pocket, one for box cars and two, one on each side of the box car schutes, for steel cars. The low chute was placed so as to load in steel cars and is used to "start" the cars, and the others top off, so that all can be used, thus saving some drop into the cars and serving to keep the coal pocket clear of any collection of dirt or excess shipping which drains to the gates when not in use.

Quick opening valves are installed for fire service, connected to the breaker stand pipe. A tank is situated at the top of the breaker, which also serves for the water distributing system.

The general layout of this plant is the result of several sketches made to embody the ideas of W. H. Loomis who was general manager at that time. These plans and details were worked out by the writer. It is a very neat and concise plant and has more than fulfilled the expectations.

A Faithful and Efficient Mine Inspector

The recent report of the State Inspectors and Examiners who examined and audited the accounts of Geo. Harrison, late chief inspector of mines, Columbus, Ohio, closes with the following testimony to the faithful and efficient manner in which Mr. Harrison has conducted his office during the eight years of his incumbency:

"The financial transactions of the State Inspector of Mines during the incumbency of Mr. Geo. Harrison from May 1, 1904, to Aug. 5, 1912, inclusive, were examined. All the receipts and vouchers issued during this period were carefully audited and checked, and all expenditures were found to have been in conformity to law.

"It would be difficult to find words to express our genuine pleasure in making this examination, and we feel sure that if the competent, conservative, economical, effective and useful work performed under the administration of Mr. Geo. Harrison and by each and every one of his official family was known as we have discovered it in the course of this examination, the public would with one accord say 'Well done, good and faithful servants.'

"Your examiners wish to acknowledge the courteous treatment and valuable assistance received from the Chief Clerk, Miss Mary Kincaid, whose efficiency cannot be questioned on account of her thorough knowledge not only of the office, but the duties and work of the field deputies as well.

Respectfully submitted,
A. B. DAWSON,
W. C. WIKOFF,
Inspectors and Examiners of
State Departments."

It is a pleasure to Coal Age to give publicity to the above testimonial of efficient work and service in the Mine Inspection Department. It is such work and efficiency on the part of all state officials, as well as mine operators, superintendents and bosses that will increase the security of the mines and the safety of the workmen. The faithful and efficient performance of duty is the highest commendation that can be given in return for service.

The Fake Promoter in Coal Mining

By John Creen*

A description of the Diamond Vale Coal & Iron Mining Co. fiasco in the Nicola Valley, British Columbia, one of the most skillfully manipulated fraudulent coal promotion schemes in the history of the Western coal industry. Conditions were such that had the enterprise been placed under the directions of a competent engineer, it would have probably developed into successful operation.

*625 Spring St., Seattle, Wash.

To enable the unitiated to better understand the methods sometimes adopted by unscrupulous promoters of almost worthless properties, the following is offered.

Preliminary Work

Some 40 years ago, a settler took up some land for ranching purposes in one of the valleys of British Columbia. About 4 years ago, an outcrop of coal was found by some prospectors who were in the district. Further investigation showed the coal to be of excellent quality and a company was formed to develop a mine.

The outcrop was found half way up the side of a hill some 600 ft. high, the seam proving to be 10 ft. thick and running directly level through the hill, round the foot of which flowed a branch of the Thompson River which is a tributary of the Fraser. Borings were made and revealed the fact that a seam of coal lay 110 ft. below the surface, at a distance of 250 yd. back from the river bank.

The matter was taken up by company promoters, money was soon forthcoming and the sinking of a rectangular shaft begun. A power house was erected adjacent to the shaft, fitted with two Babcock & Wilcox boilers and air compressors and fans were installed, as well as electric generators. A sawmill with the most modern machinery was also put up to furnish the lumber for the necessary buildings, and apparently everything pointed to a thriving, prosperous and successful mining camp. Real estate men came and commenced to plat out a townsite within a mile of the proposed mine, where the promoters at once erected a hotel and general store, stocked with every class of goods "at famine prices."

In the meantime sinking was going on, but water in large quantities was met with and pumps had to be installed. After many months of sinking the shaft was abandoned on account of the water, and boring was again resorted to, this time, 200 yd. away from the power house and only 50 yd. from the river bank. Eventually after much difficulty the seam was reached but the water problem was still a serious item. A sump, 10 ft. deep was sunk at the shaft bottom and a heavy vertical pumping engine put in. A powerful Jenks hoist had been installed, head frames erected over the new shaft, an overhead railway built and everything was now apparently in readiness to begin shipping in large quantites.

When this stage had been reached, advertisements appeared in all the principal papers, stating there would be an immediate production of 500 tons per day. These statements were embellished by photographs, showing the underground workings, siding accommodation, power-house, head frames, engine house, saw mill, etc. As a result of this the price of the shares went up by leaps and bounds, until they were at a premium and it was stated nearly $250,000 had been expended on the plant and development of the mine.

Physical Condition of the Property

It was at this stage that I was asked to take charge as Master Mechanic. The head office on the Coast informed me that they were short of engineers and that I had better engage two at least, as they proposed working three shifts of 8 hours each. Accordingly I sent two good engineers up ahead of myself, it requiring two days to reach the mine from the Coast.

On my arrival I found a truly appalling condition of things so far as the mechanical department was concerned. The man in charge of the winding engine was a butcher by trade, knew hardly anything about an engine or boiler, and yet had the lives of these miners in his hands for 8 hours a day.

Generally, the whole of the machinery both in and out of the power house was in a deplorable state and rapidly qualifying for the junk pile. In the boiler room, one could not have heard though he shouted at the top of his voice because of the escaping steam from blown out joints, unpacked glands of valves, etc. But these are not incidental to the point I wish to make, although getting these things right was no inconsiderable part of my work during the period I was Master Mechanic of this company.

To rehabiliate this plant it was necessary to work continuously and a number of the men were soon grumbling and seemed little inclined to obey orders. On inquiring the reason of their dissatisfaction I learned that they had not received any pay for the five months previous and were now disposed to strike in a body unless something was done. Of course, they could get unlimited credit at the company's store for anything they wanted, in the shape of clothing, boots, hats, tobacco, soap, towels, etc., but for which be it noted, I afterward found they, as well as myself were charged from two to three times more than the normal price; they also had their board on credit so the management thought they had no need of money. I prevailed upon them, however, to complete the work, promising to take up the matter with the management, as soon as it was done.

On Monday morning mining was resumed as usual and when the opportunity offered, I took up the question of the mens' wages with the manager. He stated that all money was paid from the head office and that the president was back East, but on his return, he (the manager) would take the matter up with him, and have all back pay squared up with the men. With this assurance the men grudgingly agreed to continue work.

Strike of the Men

The manager had been anxious to ship out a carload of coal as a sample, and for some time a box-car had stood on the siding close to the tipple. A man was detailed to hand-pick every car as it came up and throw the best lumps into the box-car, the rest being dumped on the coal pile from which supplies for the boiler house and portable boilers were hauled daily.

After a few weeks had elapsed with no settlement of the back pay question in sight, the men ceased work in a body, and threatened to take out a lien against the company's property. The manager immediately telegraphed the head office for instructions and money. Accounts were hurriedly prepared in which it was shown that many of the miners were in debt to the company for their store and board bills while the rest were only entitled to a miserable pittance after more than six months continuous work. I resigned with the men and received $40 for two months' work, both below and above ground, putting in, on an average of 14 to 15 hours a day, although engaged at $145 per month.

The company then went into liquidation, the share-holders losing over a quarter of a million dollars in plant and material and cost of development work. In spite of this fact there are two seams of excellent coal underlying this property, each about 100 ft. below the seam

of rubbish we were working on. These are said to be of exactly the same quality that another company on the other side of the river are working, who annually pay large dividends to their shareholders.

For the protection of the miner and the investing public from such unscrupulous methods, they should be exposed, not only because otherwise good properties are spoiled and abandoned, but principally on account of the hardship it imposes upon the wives and families of men, who are unfortunate enough to invest their labor in the honest belief that they will be paid for the same. It is really the wives and families of the miner that suffer, and I could cite not a few distressing circumstances caused by the dishonest methods practised by this company.

Motor Troubles in Colliery Plants

Special Correspondence

Mine service is a severe test of endurance for a motor. Troubles are continually arising which, at times, seem to baffle attempts at their solution. As a rule, however, the application of a little common sense and experience, instead of all theory, will bring the answer to the problem.

Electricity is now finding its way at a very rapid rate into favor with colliery operators, and the advantages attendant on its use are obviously of an important character. Numerous cases of difficulty, however, are bound to occur from time to time, and inasmuch as the troubles occasioned in such plants, and the means and methods adopted to eradicate them, are of technical interest to those concerned in such installations, it seems advisable to mention two or three cases where motors in colliery installations have given a certain amount of trouble.

Trouble in a Three-phase System

As a first instance, I will mention the case of a three-phase installation, in one part of which a small squirrel-cage motor driving part of a coal screen failed to start satisfactorily, and would hum loudly when the switch was closed. Even after the belt which it was supposed to drive had been pulled round by hand it started very slowly. The incident first appeared after a week-end rest, but subsequently during the remainder of that same week the motor operated fairly satisfactorily and no notice was taken of the incident.

The next week, however, the trouble was still more acute and the motor failed altogether to operate with continuous satisfaction, so that it was taken out and put into store, a new one being put in its place. After a little time trouble appeared to be developing in the new machine in somewhat the same way and in order to investigate the matter the old machine was taken out for the purpose of overhaul in order to discover what was the matter. It was first of all started up under a load, and much to the surprise of the electrician it started quite satisfactorily and ran beautifully, no trouble being experienced.

The Solution of the Mystery

On thinking the matter over, a possible solution of the occurrences came into his mind, and on taking stock of the situation, it was noticed that except for a roof over the screens, the motor was considerably exposed to weather. The atmosphere was damp and humid, and the bad starting was due to weather trouble, especially at week-ends when the motor had time to cool down and absorb exterior moisture causing the slot insulation on the rotor to become moist. This rendered the motor useless. The motor after it had been taken out of storage, however, acted perfectly satisfactorily because the rotor windings had dried out.

The Remedy

In order to prevent the recurrence of the trouble, lamps were placed inside the rotor and casing at each week-end and kept light for the whole of the time during which the motor was shut down. With this precaution no further trouble was found from this cause, so that the hint may be given to other engineers who have to deal with motors in damp situations.

Trouble with a Slip-ring Motor

Another interesting incident which occurred in a three-phase system may also be mentioned. A three-phase slip-ring motor of medium capacity was employed underground in connection with a haulage set and the slip-rings were provided with a short-circuiting gear. On one occasion when these were being operated, a dense smoke issued from the short circuiting arrangements which somewhat alarmed the attendant, who feared a possible explosion. Tests were at once taken, but everything appeared to be in order.

As the trouble had to be promptly dealt with, inasmuch as a stoppage of the haulage gear would have meant a very serious curtailment of the output of the colliery, all lights in the vicinity of the faulty motor were put out and the safety lights were darkened. The motor was then started up again and it was then seen that on switching the short circuiting plug there was a slight sparking and a sound issuing from it very much like the click of steel knitting needles.

The plug was therefore taken out and on examination it showed signs of grinding and was very badly pitted. On examining the inside of the slip-rings it was seen that these were also badly worn. The haulage set was wanted urgently so that there was no time to do anything more at the moment than repair the trouble temporarily. This was effected by filing the plug and rings as well as possible and the plug was sprung open and jammed home.

The motor was thus run in this condition until opportunity could be found to fit new rings and plug. This incident points to a possible cause of trouble in gaseous mines where slip-ring motors are employed and it is therefore highly advisable that where such motors are installed, periodic overhaul should be taken of their short circuiting devices at frequent intervals in order to avoid any undue wear and pitting which may otherwise take place. If this is not attended to it is quite possible to imagine that a spark woud be set up which in the presence of gas might cause considerable trouble.

Open Circuits in the Commutator of a Direct-current Motor

A third example which may be mentioned is derived from a direct current mining installation where a direct-current motor was direct coupled to an endless rope haulage. Every colliery engineer will appreciate the fact that in connection with such haulages there is necessarily a considerable amount of inevitable shock upon the driving gear and this combined with the vibration attendant on the fact that some haulage gears are not mounted on permanent foundations, gives rise to considerable strains on a motor which is connected up in this way. In this particular case the haulage set was put down temporarily on balks, inasmuch as it had to be moved to suit the working of the levels, and the motor was constantly giving trouble owing to open circuits which formed in the commutator and its connections.

Method of Overcoming the Difficulty

In order to overcome this, a considerable number of expedients were tried,

one of these being the adoption of flexible armature connections and commutator lugs. All the precautions were of no avail, as the trouble was constantly recurring. Eventually, however, it was found that a cure was effected by taking the motor off the self-contained base plate and mounting it on a separate foundation some little distance away, replacing the pinion on the motor shaft by a small pulley and the corresponding gear on the haulage set by means of a correspondingly large pulley. The pulley took up all shocks in transmission due to inequalities of load, while the motor was not subjected to the vibration of the haulage gear itself. In this way it was rendered immune from the troubles which had previously caused such serious difficulties, and the set ran with perfect satisfaction.

These instances will, it is thought, be found interesting to other engineers in charge of similar plants, inasmuch as they are typical of a considerable range of troubles in electrical installations in collieries, which do not involve a great degree of theory in order to effect their cure, but for the elimination of which a certain amount of practical common sense and experience is necessary. An interchange of ideas on the subject is helpful, and it is therefore hoped that these notes will lead to other experiences being related in these columns.

Steam Fireless Locomotive

By Frank C. Perkins

The steam fireless locomotive, as its name implies, is run and operated by steam, which is generated in stationary boilers, and not in the boiler of the engine itself. The principle involved depends upon the capacity of water to receive a certain quantity of heat, and to deliver up this heat for the generation of steam.

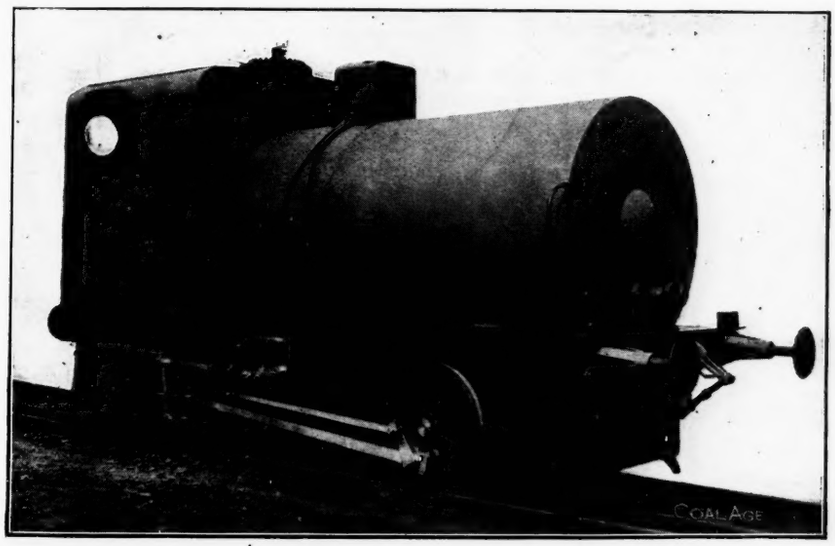
In other words, the water in the engine boiler acts as a storage reservoir of heat which is supplied from time to time by temporarily connecting it to a stationary boiler, generating steam at a high pressure. This high-pressure steam has a correspondingly high temperature and is introduced into the water of the fireless boiler by means of a perforated pipe, which is fixed in the boiler. This process continues until the temperature and pressure of the fireless boiler correspond to the temperature and pressure of the stationary boiler.

Advantages

It is easy to see the advantages of such a locomotive, when operated at a mining plant, factory or other places where switching operations, etc., are continually being performed. On account of its fireless construction, it is especially adapted for use at plants where smoke is to be avoided, or where sparks from an ordinary locomotive might be a source of danger to property.

By referring to the accompanying illustration, it will be seen that the locomotive is provided with a single cylindrical boiler. The live-steam connection will be seen in the head, although the location of this connection depends quite materially upon the position of the stationary boiler itself.

As already stated, the live steam from the stationary boiler, after admission to the fireless boiler, immediately proceeds to heat the large body of water in the fireless boiler to its own temperature. Before this is accomplished, however, the water in the fireless boiler will begin to generate its own steam, and will continue to do so until the temperature and pressure in both boilers are equal.



A German Type of Steam Fireless Locomotive

The heat loss by radiation, etc., has been reduced to a minimum by padding the boiler, cylinders and steam pipes. It is said that the loss of pressure, when the locomotive is housed in closed sheds during the long pauses of working and during the night, is only 1 to 3 atmospheres.

Aside from its other advantages, the fireless locomotive is also economical. It is unnecessary to employ an experienced engineer, since any employee can run it after having had a few instructions. Furthermore, it does not require the attention which an ordinary boiler must have; it may be left standing on the track for hours at a time without danger, since the pressure cannot build up. Deposition of scale, which is usually so destructive, actually benefits this type of boiler, in that it forms an insulation which keeps in the heat.

It is claimed that the coal consumption is considerably less, owing to the fact that the steam is generated by an outside boiler, and, consequently, arrangements can be made for burning any grade of fuel.

The low and narrow German fireless locomotives were designed for lines with especially small structure, that is to say, for transport lines in mines, tunnels, etc. The entire gear is protected from falling stones, dirt and water by means of a casing with doors. If the locomotive is intended for factory use, a slewing crane is sometimes mounted on it. This is operated from the driver's cab.

Construction of a German Type

The cylindrical boiler is fitted with cambered ends, both front and back. In the front there is a manhole with a cover fastened by two cross-bars. When the height of the locomotive permits, a steam dome is provided which is placed inside the driver's cab.

Slender baffles are sometimes built in the boiler to lessen the impact caused by the large body of water, on a sudden change of speed or sudden stopping. There is usually a small movable regulator in the dome, by means of which the steam is directed inside the boiler and across the water space, through a tube or series of tubes and thence to the cylinders. The steam passing across the superheated water is thus made dry.

To obtain sufficiently large traction power with low steam pressure, the diameter of the cylinders is made large. Thus, a locomotive is able to move back to the charging station on a level stretch on a pressure of only 5 to 7 lb. per sq.in. above atmosphere.

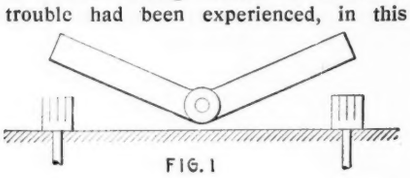
The steam-supply valves on the larger types are designed after the Allan-Trick valve in order to obtain an earlier admission. A Walschaert type of gear operates the valve. The slide blocks are adjustable, and the cross-heads are provided with shoes of phosphor bronze, to take the wear.

The brake-valve handle is placed near the throttle and reversing lever in the cab. To avoid slipping of the wheels on wet rails and under heavy traction, sand boxes have been provided and are also operated from the cab. The large types of engines are equipped with a steam separator in the exhaust tube to prevent water coming over with the steam in case of priming.

In conclusion, it may be well to say that fireless locomotives have found considerable demand in the mining industry of Germany. At a certain plant, one fireless locomotive is employed to haul a train of 24 cars loaded with briquettes to the station, whence it returns with a train of 24 empties. This same locomotive will haul, without difficulty, six charged cars of 9.85 tons capacity, making a total of 100.6 tons when the weight of the cars and locomotive is also included; 3.1 miles to the station, returning again with six empty cars to the works. This whole operation is accomplished on a single charge from the stationary boiler.

Electric Switches

In a mine where a 250-hp. motor was operated for hauling a trip, the blades of the switch, which were constructed of solid brass and were of the shape shown in the sketch in Fig. 1, used to last exactly 10 days before they had to be replaced, owing to the constant wear and tear and arcing. After considerable trouble had been experienced, in this



SWITCH FOR ELECTRIC MOTOR

case an alteration in the shape was made, the blades being given a club or axe formation at their outer extremities, as shown in Fig. 2, and this simple modification in design, by giving more substance at the point of contact, made a marked difference in the operation of the switch, inasmuch as the blades then lasted for an indefinite time. On reversing switches used on large motors, careful design is necessary, in order to secure an adequately low-current density at the points of contact.

Lignite or brown coal contains about 60 per cent. of water when first mined, but after being exposed to the atmosphere for some time, evaporation reduces the water content to about 15 or 20 per cent.

Posting a Drawslate

Recognizing the large number of accidents that occur to miners when mining coal under a drawslate, the Pennsylvania bituminous mine inspectors, some years ago, held a meeting to devise plans to reduce the number of these accidents in the mines operating in the Pittsburgh coal seams.

After a thorough discussion of the subject in all its phases and comparing notes, the inspectors adopted unanimously the following plan, and recommended the same to be used for posting drawslate in the mines of the Pittsburgh coal seam. The instructions were printed and a copy was sent to every superintendent, mine foreman, assistant mine foreman and fireboss, working in this seam at that time. The instructions were clear and simple, and illustrated by an accompanying plan and section, shown in this article.

At the same time, a plan for posting roof was recommended, to be used in the pillar workings of the Connellsville coke region. This, also, was sent to each mine official working in that field. It was requested of each superintendent and mine foreman that a space of at least 2½ ft. be provided between the car and rib, on the brake or spragging side of the haulage road; and that such space be maintained throughout the entire mine, and be kept free from all obstructions. The request was made at the same time that safety lamps be used in the pillar workings of all mines in which firedamp had been generated or was likely to be generated. Blueprints of these plans and instructions or recommendations were prepared for posting at each mine.

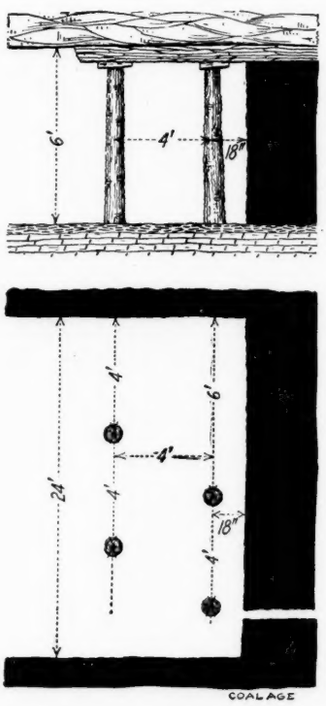
The chief of the Department of Mines promptly approved all of these plans and recommendations before they were distributed. The main features of the plans and the recommendations of the inspectors have been since included in the recent revision of the mining law in the bituminous district of Pennsylvania. The entire inspection department have made every effort in their power and used every precaution to reduce the number of accidents.

A letter from Inspector Arthur Neale, of the 19th Bituminous district, Irwin, Penn., states: "Where the plans of setting posts have been enforced the number of accidents from slate falls have been greatly reduced. Accidents from persons being caught between the cars and rib, on the haulage roads, and from explosions of gas are becoming rare. The enforcement of the propping system is made possible by the increased number of visits of the mine officials, to the working places as well as the better discipline required in the mine, by the new mining law, which has now been in effect a little over a year."

Following are the instructions prepared and sent out to every superintendent, mine foreman, assistant mine foreman and fireboss, working in the Pittsburgh coal seam, as stated above.

* * * *

PLAN OF POSTING DRAWSLATE, RECOMMENDED BY THE MINE INSPECTORS OF THE PITTSBURGH-COAL REGION AND APPROVED BY THE CHIEF OF DEPARTMENT OF MINES, HARRISBURG, PENN.



The Drawslate shall be posted with two [2] rows of posts, always placing same under the slate as promptly as circumstances will permit.

The first row of posts is to be placed about one foot from the edge of the slate. The first post from the rib shall not be a greater distance than four [4] feet, then the next post to be not over four [4] feet from this post, and so on across the room or entry to the other rib.

The second row of posts should not be over twelve to eighteen [12 to 18] inches from the back end of the cut or face of the coal. The first post set in the back row shall not be over six [6] feet from the side of the rib, then the second post in this row not to be over four [4] feet from the first post having no greater distance than four [4] feet between posts.

Thus, when the whole of the slate over a cut of coal is posted the position of the posts will represent [after the coal is extracted] a series of equilateral triangles across the face of the room or entry, as shown in the above cut, which represents a room 24 feet wide, where the slate is posted after the cut of coal is removed. This system of temporary posting is to be used in all rooms and entries where slate is not taken down as promptly as the coal is removed.

In pillar workings where the draw slate is not taken down as promptly as the coal is removed, the posts should be set not more than three [3] feet apart, [distance between posts and face not to exceed four [4] feet under any condition], keeping same in rows parallel to and perpendicular to the retreating face, maintaining in position a sufficient number of rows to insure the slate being kept in a firm and safe condition until the posts are withdrawn.

Mine Inspector, —— Bituminous District.

Action of Solvents on Coal

By Vivian B. Lewes*

Ether, alcohol, naphtha and benzol dissolve small parts of the coal substance. Guignet experimented successfully with phenol and Bedson with acetic anhydride, glacial acetic acid, turpentine, aniline and pyridine. Pyridine however not merely dissolves but combines with the coal substance, increasing the volatile matter and nitrogen content of the residue. Sodium hydrate saponifies some resins and weakens the coking bond. Pyridine probably dissolves out the same resins with like result.

Note—Abstract of a Cantor lecture on the "Carbonization of Coal," delivered, Nov. 27, 1911, at the Royal Society of Arts.

*Royal Naval College, Greenwich, Eng.

The researches, intended to throw light on the composition of coal, have either distilled the fuel at various temperatures drawing inferences regarding the nature of the original substance from the products resulting or have attacked the coal directly by means of solvents.

The early attempts to isolate definite bodies from coal by solution were none of them very successful; ether, alcohol, petroleum ether and benzol[1] proving to have but little action. However, E. Guignet succeeded in extracting a small quantity of a brown amorphous body from a bituminous coal by the use of phenol,[2] but this body he did not identify.

The Bedson Experiments

In 1894 P. Phillips Bedson reported to the British Association the results of a long series of experiments, in which besides these solvents, he also tried acetic anhydride, glacial acetic acid, turpentine and aniline[3], the latter solvent proving the most successful, extracting from the coal a body of the same character as that obtained by Guignet, which when treated with benzine and with ether yielded on evaporation bodies of a resinous character.

He also found that when finely divided coal is suspended in boiling water and permanganate[4] added, oxidation of some constituents of the coal ensues, and a dark brown alkaline liquid is formed. In a further report in 1896 he gave the results of acting upon coal with hydrochloric acid and potassium chlorate[5], and showed that chlorinated compounds are formed of the same character as those obtained by Cross and Bevan from jute fibre.

Pyridine the Most Active Coal Solvent

Bedson made a great advance in this line of research when in 1899[6] he pointed out the solvent power of pyridine[7] bases extracted from coal tar, which dissolved 16 to 18 per cent. of a Durham coal but had no action on anthracite. In 1901 Baker[8] experimented upon the action of this solvent on several coals, and found that from Durham coal (Hutton seam) 20.4 per cent. could be extracted with pyridine, and that after extraction the residue had lost the coking properties of the original coal.

This observation was confirmed by Anderson and Henderson[9] in 1902, who tried the action of pyridine in a research upon the coals of Bengal and Japan, and also upon some Scotch coals, the coking powers of which were known, and they found that the extraction of a strongly coking coal by pyridine weakened the coke, whilst with inferior coking coal the property is entirely destroyed.

In 1908 Bedson[10] read a paper before the Society of Chemical Industry, in which he gave the results of experiments upon six coals obtained from the Redhaugh gasworks, which seem to show that with some gas coals an amount equal to practically the whole of the volatile matter capable of being driven off by heat can be extracted by pyridine.

PYRIDINE EXTRACT COMPARED WITH VOLATILE MATTER

	Volatile matter per cent	Pyridine extract per cent	Gas Works yield per ton	Candle Power
I.....	34.10	32.36	11,381	16.63
II.....	33.29	35.59	11,392	16.50
III.....	31.91	24.58	11,646	16.40
IV.....	31.70	22.81	11,108	16.00
V.....	33.65	29.97	10,913	16.39
VI.....	30.87	22.53	10,730	15.76

Now from these figures the inference is that in a coal like II everything beside the fixed carbon and ash has been dissolved, that is, the humus, resin and hydrocarbon bodies, and it would have been of the greatest interest had Bedson made an analysis of the residue, or at any rate shown that no volatile matter was left in it.

I have never had the good fortune to obtain a coal from which the pyridine extracted a percentage equal to the volatile matter as given by analysis, even after much longer periods than those utilised by Bedson, but such a coal offers a most valuable field for further examination.

Pyridine Dissolves Humus Bodies and Resins

Of all the volatile matters in coal the humus bodies are by far the most resistant to the solvent action of pyridine. They are practically insoluble, but there are also undoubtedly some forms of resin constituents in coal which are nearly insoluble.

Bedson found that the volatile matter in cannel coal varied very much in its solubility, whilst the hydrocarbons in shale were insoluble, and yet the destructive distillation of these bodies shows them to be very rich in resin constituents.

Strength of Strong Coke due to Insoluble Resins

It appears probable that in a feebly coking coal the coking property is due almost entirely to the soluble form of resin constituents, and can therefore be entirely removed by extracting the coal with pyridine: whilst on the other hand in strongly coking coals the property is due partly to soluble resin bodies, but to an even greater extent to other hydrocarbons of resinic origin which resist the solvent action of the pyridine, so that the coking property is weakened but not destroyed by extraction.

A similar conclusion was arrived at by Anderson and Roberts[11] in 1898 from an entirely different point of view. Dr. Percy more than fifty years ago pointed out the evil effects of weathering upon certain coals and slacks, and showed that if a fairly good coking coal was kept at a temperature of 572 deg. F. for a few hours and is afterwards heated to redness, it does not swell and coke. Anderson and Roberts, in trying this same experiment with various Scotch coals, found that, although it was true for a coking coal of medium power, a really strong coking coal had the ability to coke only weakened.

The Resins, which can be Saponified, Contribute Largely to Coking

They found also that the same phenomenon could be brought about by treating the two coals with sodium hydrate[12]: and the conclusion is that although

[1]Ether, CH_3OCH_3; alcohol, C_2O_5OH; petroleum ether = naphtha; benzol, C_6H_6.

[2]Phenol, $C_6H_5(OH)$.

[3]Acetic anhydride $(CH_3CO)_2O$; glacial acetic acid, $CH_3CO.OH$; turpentine, mostly $C_{10}H_{16}$; aniline, $C_6H_5NH_2$; benzine, C_6H_6.

[4]Potassium permanganate $KMnO_4$.

[5]Potassium chlorate $KCl\ O_3$.

[6]Trans. North Eng. Min. Engineers, 1899, 82-87.

[7]Pyridine C_5H_5N.

[8]Trans. North Eng. Min. Engineers, 1901, 23-28.

[9]Journ. Soc. Chem. Ind., 1902, 233-237.

[10]Journ. Soc. Chem. Ind., 1908, 147.

[11]Journ. Soc. Chem. Ind., 1898, 1013.

[12]Sodium hydrate NaOH.

resinous bodies which can be saponified or oxidised contribute largely to the coking, yet there are also present non-saponifiable bodies which in breaking up under the influence of heat yield enough luting to form coke, and I think the action of pyridine shows that this non-saponifiable body or bodies consist of substances very probably akin to those found in shale and some cannels.

Burgess and Wheeler[13] in a paper read before the Chemical Society this year describe experiments on a Silkstone coal containing 33.4 per cent. of volatile matter. They succeeded in extracting 30 per cent. by means of pyridine, leaving a coke-like residue, which on distillation at 1652 deg. F. yielded hydrogen and oxides of carbon—they would have found methane as well if they had looked for it. The extract on destructive distillation yielded a mixture of the paraffin hydrocarbons and hydrogen.

At first sight this looks as if pyridine was a solvent which could be used to separate the humus and resin constituents. but Messrs. Burgess and Wheeler are careful to point out that "they hesitate to identify absolutely the paraffin-yielding constituents of coal with that portion extracted by pyridine."

Is Pyridine Merely a Solvent?

They are wise in being cautious as there are several anomalies to be cleared up. I have found several times that after extraction the residue contains as much and sometimes more volatile matter than the original coal in spite of repeated washings with acid, drying in vacuo and other forms of treatment intended to eliminate all pyridine, whilst the composition of the extract also shows anomalous results, and after the most careful measures have been taken to free it from pyridine, it will sometimes still contain more nitrogen than did the original coal.

It is to be noted that so far the two most successful coal solvents have been aniline and pyridine, both of them alkaline organic bases, and as we have seen that the effect of extraction by pyridine has been the same upon the coking power of the coal as treatment with sodium hydrate, which saponifies the resin constituents, it seems highly probable that the pyridine forms a compound with the resin bodies or some portion of them, and this compound is soluble in excess of pyridine, and if this is so it should be traceable by the presence of nitrogen in the extract.

In an experiment made by Baker[14] he treated coal from the Hutton seam with pyridine, and after carefully freeing the residue and extract from pyridine analysed them with the following results—

EXTRACT FROM HUTTON COAL BY PYRIDINE

20.4 *per cent extracted*

	Original coal	Residue	Extract
Carbon	80.82	82.06	79.37
Hydrogen	4.66	4.85	5.79
Oxygen	10.81	9.65	10.73
Nitrogen	1.84	1.78	2.66?
Sulphur	1.84	1.23	1.40

and he queries the nitrogen in the extract, evidently thinking it a mistake.

Anderson[15] also analysed a Bannockburn main coal and the matter extracted from it by pyridine—

MATTER EXTRACTED FROM BANNOCKBURN COAL

12.8 *per cent extracted*

	Original coal	Extract
Carbon	86.70	83.39
Hydrogen	5.38	6.05
Oxygen	5.94	7.30
Nitrogen	1.98	2.86

In each case there was a large increase in the nitrogen, and Baker's analysis of the residue shows that it did not come from the coal, and the probabilities are that the extract is a feeble compound of the resin body and pyridine. In the case of the Hutton coal the coking power was destroyed by extraction, and in the case of the Bannockburn coal weakened. The extracts when distilled gave very large volumes of rich gas, and left a strong but intumescent coke.

The Residues After Solution by Pyridine have more Volatile Matter than Coal

The residues after extraction show a still more remarkable anomaly. As it is manifestly the resin constituent which has been extracted, one would expect that on determining the volatile matter in the residue it would be found to be as much lower as the amount extracted, but it proves to be very nearly as high, and in many cases higher than in the original coal.

Anderson and Henderson, in their examination of coals by pyridine, give the losses of weight which the residues from the extraction sustain on heating. These are here contrasted with the original volatile matter in the coal.

FIVE COALS ALL OF WHICH APPEAR TO COMBINE WITH PYRIDINE

Volatile Matter	I	II	III	IV	V
In original coal	31.98	39.89	46.59	27.4	36.78
In residue	39.26	44.14	49.14	29.6	43.02
Per cent extracted	10.8	7.0	21.7	12.8	14.5

This increase in the amount of volatile matter present in coal can mean only that the pyridine has attached itself to some constituent in the coal to form a compound insoluble in excess of pyridine, but the only analysis published of a residue with the percentage of nitrogen determined (that of Baker) shows no sign of this, as the nitrogen is the same as in the original coal, but the volatile matter in the residue is not given.

In an experiment upon a Durham coal (Londonderry) made in my laboratory the coal lost 18 per cent. of its weight to the pyridine and the following results were obtained:—

ACTION OF PYRODINE ON A DURHAM COAL

	Original, ash and moisture free	Residue from pyridine	Pyridine extract 18+
Carbon	82.87	79.15	81.04
Hydrogen	5.57	4.71	7.18
Oxygen	8.72	14.00*	7.98
Nitrogen	1.68	2.14	3.80
Sulphur	1.16	not det'd.	not det'd.
Fixed carbon	63.00	64.46	not determined
Volatile	37.00	35.54	

* oxygen plus sulphur.

In this determination the increase in nitrogen over the amount present in the original coal in both residue and extract points to the presence of compounds of pyridine in both. Further the increase in hydrogen in the extract, taken in conjunction with the decrease of hydrogen in the residue points to its having been a resin body that was dissolved.

Perhaps the Non-Oxidisable Bodies are no Longer Resins

These considerations seem to make it clear that the resin constituents condition the coking of coal during destructive distillation, and that they are of, at least, two kinds:—The one class is easily oxidisable, is soluble in pyridine and saponifiable by alkalies, and on weathering is oxidised into a humus body with evolution of water and carbon dioxide. It is responsible for the heating of coal: The other class is non-oxidisable, not saponified by alkalies, and forms with pyridine a compound insoluble in excess of the reagent, and this class may be the hydrocarbons from decomposed resins, as the residue in which they are present yields rich liquid hydrocarbons as tar and pitch, but not rich gas.

My own opinion is that, although pyridine is a better solvent for coal than any other of which we know, yet that it will never prove more than a useful first step in the separation and identification of the complex mixtures present in the coal, whilst even then pyridine has an awkward knack of attaching itself to other molecules, which makes it difficult to separate without using such drastic measures as are quite likely to alter the nature of the bodies dissolved in it. Several observers are at work upon the problem, and it is to be hoped that satisfactory results will soon throw light upon this complicated subject.

Hygroscopic Water does not Assist Coking

Coal always contains a certain proportion of water which appears to be

[13] Chem. Soc. Journ., 1911, 654.

[14] Trans. North Eng. Min. Engineers, 1901, 23-26.

[15] Journ. Soc. Chem. Ind., 1898, 1013.

held partly mechanically and partly in some form of combination. In this it resembles wood, which after long air-drying still retains an average of 20 per cent. of moisture. If this is driven off at high temperature it is reabsorbed from the air. The portion of the water mechanically held by the coal is generally know as "pit-water" and represents ordinary wetting, which can be displaced by air-drying, but the so-called "hygroscopic water" is driven out only by heating the coal to 212 deg. Fahrenheit.

Such heating extended for some hours causes oxidation of the resin bodies. But it also tends to destroy the coking properties of the sample, a result which has led some observers to conclude that hygroscopic water is essential to coking. This is manifestly incorrect, as the tertiary coals, which contain the largest quantity of hygroscopic moisture, will not coke, owing to the proportion of humus derivatives being largely in excess of the resin bodies.

The Sulphur, Ash and Nitrogen Sources

We have already seen that the ash of coal represents mineral constituents present in the sap of the original plants, or derived from the surrounding strata during the formation of the coal. Nitrogen, derived from the proteid bodies in the vegetation, is always present to the extent of 1 to 2 per cent., and is probably mostly borne by the humus bodies in the coal.

These are also most probably the carriers of the organic sulphur which has been clearly proved to be present. The bulk of that constituent, however, is in the form of pyrites which has been produced from the reduction of mineral sulphates which reacted upon iron salts. The latter infiltrated in solution into the coal measures.

A Firedamp Detector

London Correspondence

Captain V. B. Nesfield, of Bijnour, United Provinces, India, has described an instrument he has devised for revealing the presence of firedamp and which he claims is so sensitive that it can detect one part of methane in 4000 parts of air, though it can be regulated so as to indicate the gas, only at the point when an explosive mixture is present.

It consists of a porous porcelain tube, preferably a Kitasato tube as used for filtering bacterial cultures, open at one end and closed at the other. The indicating apparatus is attached to the open end. In making it, a piece of glass tubing about ¼ in. in bore is drawn out at one end to a capillary which is bent on itself so as to form a U tube about 2 in. long, the base of this capillary being also slightly widened by blowing.

A second piece of tubing is also drawn into a capillary at one end and is fused in the large end of the first piece of tube in such a way that the capillary projects into it. Perfectly clean mercury is then introduced through the second capillary into the wide part of the first piece of glass tube in such quantity that it descends only for a short distance down the capillary U tube when the apparatus is held vertical.

The top of the second tube is then inserted in the porous tube, and to protect the indicator a wider glass tube having a hole in its side, is passed over it and attached to the outside of the porous tube. The employment of the instrument depends on the fact that if equilibrium be established between gravity which tends to drag the mercury down the U tube and surface tension which tends to draw it up to the main globule, then the slightest additional force applied to the upper surface of the mercury destroys the equilibrium and all the mercury descends the capillary tube.

Such an additional force is brought into play through osmosis when a test tube containing air with a trace of coal gas is placed over the porous tube, the pressure in the interior of the tube and consequently of the indicator being raised by molecules of marsh gas passing through the pores of the porcelain. The movement of the mercury, therefore, indicates the presence of marsh gas. Captain Nesfield has not patented the instrument, and he hopes someone interested in mines will have one made and give it a trial.

Attention of Western Coal Men

The letter from W. F. Murray, Victor-American Fuel Co., Delagua, Colo., which is printed below, is one of several communications from Western coal men, deploring the fact that there is no Coal Mining Institute organized to cover their particular field.

We suggest, therefore, that all our readers and others interested in southern Wyoming, Colorado and northern New Mexico, write us their views on this matter and nominate some person who they think would be interested, and who might be induced to issue a call for a meeting. The man to be chosen as temporary chairman should be centrally located so that he may be in touch with all parts of the field.

The subscribers to Coal Age *in the district above referred to number* 339, *and if only half these men answer the call, there will be a sufficient nucleus for effective action.*

We wish it understood, however, that Coal Age *disclaims any desire or intention to dictate or participate in the organization of this or any other mining institute. Our activities end when we have properly used our office in bringing about the initial meeting in strict compliance with the requests of responsible coal men. Let all who believe there is need for such an institute, and who wish to become charter members, communicate their views to us at once. Mr. Murray's letter follows.*—Editor.

It is to be greatly regretted that we have not in the West a society composed of men engaged in coal mining, such as is found in Pennsylvania, West Virginia and other states.

The purpose of such a society would be to advance the coal-mining industry in the West; to encourage education in practical and scientific mining; and especially to bring the coal-mining men of the West into closer relation with one another, thus promoting a friendly feeling through social intercourse and the discussion of mutual interests.

If we had such a society, it could not fail to benefit thousands of men engaged in coal mining. We would absorb the ideas of others and the exchange of ideas and discussion of problems which are constantly before us would be mutually beneficial.

There is probably no section of the United States where coal-mining men know so little about what is going on in their own state, district or county, as in the West, for the simple reason that they have no opportunity or means of getting together. The only solution to the problem would be the organization of a society whereby, at least once a year, meetings could be held. That such gatherings would be advantageous to all cannot be gainsaid.

That Utah, Montana, Wyoming, New Mexico and Colorado, with their hundreds of mines and thousands of mining men have not a society of this kind is to be deplored. No doubt there are many lights being hidden under bushels which would shine brightly if they had the opportunity.

There is no doubt but that the presidents, general managers and state inspectors would heartily indorse this idea. It would not only prove materially beneficial to them, but would give the men under them new ideas. If someone would only give the ball a little push, we would all endeavor to keep it rolling.

The first shaft to be put down by the freezing process was the Archibald Lignite Colliery, at Schneidlungen, Germany, in 1883. Until quite recently, sinking to a depth of from 300 to 500 ft. has been regarded as something extraordinary, but a German shaft has been successfully put down to a depth of 990 ft., about 820 ft. of which was quicksand and thin beds of sandy clay. There are now other shafts in the course of sinking by this method that will be nearly 1500 ft. in depth.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

When we want to buy a suit of clothes and the tailor has a dozen excellent samples to show us, we are likely to experience more trouble in making a choice than if we had only two patterns to pick from. So it is in life, one fellow succeeds in one way and another man reaches the goal by an entirely different route, which causes us some confusion in trying to select a plan of procedure for ourselves.

There are those who jump from place to place, widening their experience and all the time advancing in their chosen profession. It is easy to name a dozen men now at the top of the coal-mining ladder in America, who have managed mines in a half-dozen fields.

On the other hand, there are scores of well known managers, superintendents, and engineers who have stuck to their first love like adhesive tape to a sprained ankle. Snows have come and gone, but through "fair and foul" these men have remained loyal, never faltering in their belief that Opportunity resides in the same house with them, and therefore must call from within.

And when a man of the stay-at-home type advances step by step to a high position of honor and trust, you can rest assured that he possesses ability of an uncommon order. We all know the old saying: "A prophet is not without honor save in his own country," and this idea is true in the business world today.

A great many high officials never can see genius contained in an employee of their own. Like the man who always thinks the other fellow's girl is prettiest, these individuals can never look down in their own yard and find human material of the sort they want. At least they don't recognize real value in a subordinate until some near neighbor has tried to annex him.

Herman V. Hesse, manager of all the Maryland mines of the Consolidated Coal Co., tied up with the Watson interests in Fairmont, W. Va., back in 1900, when he transferred his affections from the anthracite to the bituminous industry, and since that memorable event, he has never followed other flag than the emblem of these same interests.

Some people say that his first name should be spelled with a "G" instead of "H," but his intimate friends and especially all his employees contend that there are other easy ways of determining his nationality.

He never flirts with a new idea, no matter how attractive the clothes it wears, but when said idea is properly introduced and the friendship endures through the stages of a brief, but intimate association, then no mortal power can dislodge the thought from his mind. He is the slowest man I ever knew—at forgetting.

HERMAN V. HESSE

Mr. Hesse was born at Bethlehem, Penn., Sept. 2, 1870, and received his early education in the Moravian Parochial School in that town. On finishing his preparatory course, he entered Lehigh University, graduating from that institution in 1891 with the degree of Bachelor of Science (B.S.) His university course was continued in 1892 when he was given the degree Engineer of Mining and Metallurgy (E.M.)

The first job that Herman filled was that of chainman in the engineering department of the Lehigh & Wilkes-Barre Coal Co. at Audenried, Penn., in what is commonly known as the Hazleton region. After securing a year's training with the L. & W. B. Co., he became connected with the engineering corps of the Lehigh Valley Coal Co. at Lost Creek in the Schuylkill region. The next seven years were spent at Lost Creek and Centralia, working most of the time underground as transitman for the L. V. company.

In May, 1900, Mr. Hesse left the anthracite field and accepted a position as assistant engineer with the Montana Coal & Coke Co., Fairmont, W. Va. In 1901 when the Montana Coal & Coke Co. was enlarged and formed into the Fairmont Coal Co., "H. V." was appointed chief engineer of the new corporation.

In 1903 there was a further change, the mines in the Fairmont and Clarksburg region were consolidated with other properties in the George's Creek field of Maryland, the new combination being known as the Consolidation Coal Co. C. W. Watson who had engineered the combine, became president of the new company, and appointed Mr. Hesse chief engineer of the united interests.

In 1906, Herman was made general superintendent of the Consolidation Coal Co. in the George's Creek region, and in August, 1909, was appointed manager of all the company's mines in Maryland. A number of flattering offers have been made Mr. Hesse by coal operators in other fields, but the Consolidation company, its men and methods have become such a part of himself that he knows no other religion, and up to the present time no prospective employer has been able to entice him away.

His early training in the anthracite field with the Lehigh Valley company was just the sort of practical experience needed to equip him for engineering work in the coal mines of West Virginia. The hard-coal companies had perfected the most elaborate schemes of engineering that existed anywhere in this country. The principal handicap the anthracite engineers had to undergo was in not being able to use all the refined knowledge that they possessed. The mines were old and the underground workings were so extensive that because of large abandoned areas and for the reason that the task would have been stupendous, it was considered out of the question to re-survey and re-map all the old collieries.

Mr. Hesse and other anthracite engineers who migrated into the newer bituminous fields were able to start from the base-line up, and put into effect every modern method that had been proved out in practice. There isn't any doubt at all but that the engineering department of the Consolidation Coal Co. is a model organization that might be copied to advantage by other coal concerns, and certainly no one deserves greater credit for the perfected systems employed than does H. V. Hesse.

He makes no parade of himself or his deeds, and believes high distinction results from service rather than show

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Contents

	Page
Foreword	245
Ideas and Suggestions:	
Solving a Low Coal Problem	246
Will the Use of Coal Decline?	246
How to Deal with the Foreigner	247
Preparation of Coal	248
The Use of Concrete for Brattices	248
Guiding Ropes on Curves. Jos. Daniels	249
The Manufacture of Briquettes	249
A Spanish Syndicate	249
The New Harleigh Breaker. F. B. Davenport	250
The Fake Promoter in Coal Mining. John Green	255
Motor Troubles in Colliery Plants	256
Steam Fireless Locomotive. Frank C. Perkins	257
Electric Switches	258
Posting a Drawslate	258
Action of Solvents in Coal. Vivian B. Lewes	259
A Firedamp Detector	261
Attention Western Coal Men	261
Who's Who—In Coal Mining:	
Sketch of Herman V. Hesse	262
Editorials:	
The Mining Promoter	263
The Part Moisture Plays in an Explosion	263
"Strike But Hear Me!"	264
Sweden as a Coal Market	264
Colliery Notes	265
Discussion by Readers	266
Examination Questions and Answers	268
Sociological Department:	
Evidence That the Miner Resists Tuberculosis. J. M. Wainwright and H. A. Nicholls	269
Coal and Coke News	271
Coal Trade Reviews	275

COAL AGE

The Mining Promoter

The fake promoter has probably not found coal mining such a lucrative field in which to practice his machinations as other branches of the mineral industry, but that we are not entirely free from incursions of this scourge is evident by the article "The Fake Promoter in Coal Mining," appearing in this issue.

Such instances as these have proved serious handicaps to the legitimate development of our mining industry, and while this is more applicable to the metal end of mining, there are far too many cases of this kind on record in the coal-mining branch. These tend to cause the average investor to regard coal securities with disfavor, if not open suspicion, while such is entirely unjustified and every effort should be used to remove such an impression from the investing public.

Coal mining presents as broad and inviting field for conservative capital as any other industry in the country. While it is granted that certain risks attend investments of this nature, the same holds true for every other industrial enterprise, to a greater or less extent, and moreover coal engineering has now been developed to such an exact science that these risks may be regarded as negligible, when the proper precautionary measures have been exercised and the work placed in charge of competent and reputable engineers. And, furthermore, as is well known, a successful mining venture ordinarily yields a greater income on the money employed, and has a higher potential value than any other class of industrial investment.

In the case of the Diamond Vail Company, which we print in this issue, there appears to have been no limit to the avarice of the promoters. Not only was the unsuspecting public induced by the various devices common to such schemes to purchase the securities of this concern quite freely, but the employees as well were defrauded of many months' earnings. This was accomplished through intermediary of the company store and boarding house, in both of which the men were given unlimited credit, but at such exorbitant prices as to absorb practically their entire wages.

It may be here stated that the company store has long been the cause of much friction between miners and operators. The former frequently accuse the latter of taking advantage of his prerogative to suppress competition by imposing excessively high prices on the necessities of life. While such instances may have occurred, it is believed, in the main, that the operators have found their mercantile departments such a continual source of friction and trouble that they would be only too glad to dispense with them were such a thing possible.

While it is not the intention of COAL AGE to assume the role of muckraker, we believe publicity to be the best remedy for such evils as the one here described. Our columns are always open for descriptions of this nature, particularly of such instances where there is a possibility of protecting our readers and increasing the prestige of the industry.

The Part Moisture Plays in an Explosion

The majority of people are firmly of the belief that explosions are hindered in their propagation and reduced in their violence by the presence of moisture. But there is a growing tendency, which needs checking, to regard water vapor as an aid to an explosion of methane, and one writer has claimed that an absolutely dry mine cannot be the scene of an explosion, adding, however, with due conservatism, that a mine so dry cannot well be conceived.

We take pleasure in quoting from the recent book on the "Ventilation of Mines," by R. A. Redmayne, chief inspector of mines in Great Britain: "It is a fact that vapor in the air adversely affects the explosibility of gases, the fine particles of water acting as heat absorbents, and it has been determined that a saturated air current of a temperature of 62 deg. F. requires about 7 per cent. more heat units than does dry air in

order to attain a temperature of 1213 deg. F., which is the ignition point of firedamp. Thus gasoline-driven automobiles and other internal-combustion engines consume less fuel on a cold dry day than on one which is warm and moist."

The argument seems so logical that one wonders how any other could have arisen. The reason is that carbon monoxide demands the presence of an intermediary hydrogen compound in order to explode. This to be immediately effective must be in the needed proportion, for in its burning, carbon monoxide does not generate water vapor as do hydrogen compounds —methane, ethane, hydric sulphide, or that mixture of hydrogen and oxygen, electrolytic gas.

In 1880, Harold B. Dixon showed that moisture had a marked influence on the union of carbon monoxide and oxygen and that no explosion could be caused by a spark when the gases were dry. He said: "When a spark from a Leyden jar is passed through a mixture of two volumes of carbonic oxide and one volume of oxygen, which has been thoroughly dried, no explosion is caused. A comparatively small number of water molecules suffices to determine the ignition, but the explosion gains intensity, the greater number of water molecules present."

Almost any gas containing hydrogen will serve the purpose, hydric sulphide, ether or hydrogen itself. But carbon dioxide, nitrogen or cyanogen will not serve. It is only hydrogen which combined or combining with oxygen will offer to the monoxide in acceptable form, the atom of that gas which it needs for its further combustion.

And after these results were shown and declared to be in error, as nearly all new results are by captious and less competent critics, then a new tack was taken. It was held that water was the universal *entrepreneur* without which there could be no explosion. Dr. Dixon could never bring himself to such a view, and in 1907 he said, speaking of himself and Dr. Bradshaw: "We made experiments which showed that an electric spark would fire ordinary electrolytic gas, whether in the dry or moist state; and experiments on the rate of detonation in that gas seemed to show that, once an explosion wave was started, no influence was exerted on the propagation of the wave by aqueous vapor except a slightly retarding one."

After reading these quotations and the letter in this issue, we hope that no one will quote Harold B. Dixon as an adherent of the belief that all ignition is impossible where moisture is absent.

It is true that a damp atmosphere in a mine is no great factor in preventing an explosion, except when a deposition of moisture from such air has continued some time. This is shown by the experiments of the Bureau of Mines, for explosions have been propagated in the testing gallery with dry dust when the air was 90 per cent. saturated. In fact, in order to get immunity from a coal-dust explosion, when all conditions are favorable, the moisture content of the coal dust should be raised about 25 to 30 per cent.

Our aim must be not to obtain damp air only, but a wet mine with every dust particle covered with an enveloping film of moisture.

"Strike But Hear Me!"

We used to wonder out of what ingredients a coal-mining journal should be made. Today we have fewer doubts on that score. We must have struck near the correct elements and the right synthetic methods or we would not have arrived at a point where we have to publish over 8000 copies to keep pace with all demands, after less than a brief year of publication.

The popular note in a journal finds a multitude of contemners. There will always be those people who applaud a paper which they will not read, and not a few who will praise a journal they cannot understand, but they are glad enough to find something they can and will read, and finally, when all airs are laid aside and man meets man, the periodical wanted is the one they can peruse and understand.

That is why COAL AGE has popular features. We are not seeking to fill it with jacobians and other higher mathematics. We realize that captains of industry are raised on other food, and that if we would minister we must provide digestible fodder. The professor has time and need and the faculty for the quadrature of the paraboloid, but a man who can handle such problems is in a monastery like Pascal, an observatory like Newcomb, or a university like Kelvin, he is not getting coal out of the ground.

Moreover, we are not always keyed up to our full pitch, and we want sometimes to strike a lower note. That is why COAL AGE is occasionally popular. Its editors have studied the psychology of attention. Some days are warm, others gloomy, and some too fine for us to care to grind.

As Themistocles told the commander of the Greek host, "Strike but hear me." Knock if you will against the untechnical foreword, the genial "Who's Who" and the discussion with the taint of human nature; knock but read. We care not who is offended by the fact that we are not always riding a Pegasus so long as we find we are telling somehow something worth while and have an attentive audience.

Sweden as a Coal Market

"The English coal strike opened the eyes of Swedish dealers and manufacturers to the danger of depending solely upon British coal. Sweden produces comparatively little coal, perhaps 100,000 tons, but it is of a poor quality. Only small quantities are imported from Germany, and the outlook for American coal would be good if the question of freights were solved.

"Those interested in the subject are studying the feasibility of running tramp ships between Sweden and the United States carrying iron ore to American ports, and West Virginia coal as a return cargo. Imports of coal and coke into Sweden during 1910 were valued at $16,265,000."

This quotation from the Consular and Trade Report is more plausible than those usually found therein. We are receiving some iron ore from Sweden and much pulpwood. These are somewhat low-grade cargoes and it is doubtful if the plan of carrying iron ore and pulp to America, returning with coal could be made profitable to the tramp steamer.

England gets a large proportion of her timber from Sweden; in fact she is entirely dependent on the Baltic countries for her timber supply. Her trade with Sweden is large and does not have to be stimulated and it is likely, therefore, that no normal conditions will permit the West Virginia coal operators to enter the market when the cost of shipping from that state is considered.

Colliery Notes and Comments

Practical hints gathered here and there, and condensed to suit the busy reader

In 1873, the wage of a good coal miner was from 50 to 75c. per 100 bushels of coal mined, drivers $1.50 per day, coke drawers 60 to 70c. and over, while common laborers received 80c. per day in script.

The output of coal per capita for the principal producing countries of the world is as follows: United Kingdom, 6 tons; United States, 4½ tons; Belgium, 3⅓ tons; Germany, 2¼ tons; France, less than one ton.

In steam boilers the various forms of internal corrosion are mostly due to acids contained in the feed water. Internal corrosion is one of the principal causes of boiler explosions and the lives of large numbers of boilers are greatly shortened by it.

It is a good rule when drawing timber to insist upon the use of a lever and chain, or some similar contrivance. Many accidents in coal mines have occurred through this rule not being complied with, and it should be strongly impressed upon the mind of the person in charge.

Locked coil ropes are favored because they are nonspinning, afford increased strength and safety and, possessing a smooth even surface, they have no friction. The most important disadvantage is that the wires are not so intimately woven as in the ordinary wire rope.

For calculating the weight of coal or other material to be obtained from a given area, the following is a good rule: Divide the specific gravity by 48, and multiply by the thickness of the bed in inches and the number of square yards in the area. This gives the weight in tons.

In the United Kingdom, a recovery of over 300,000 tons of ammonia per annum is being effected by various byproduct plants of different kinds. About one-half of this is being recovered at gas works, and the remainder at iron works, shale works, coke-oven plants, producer-gas and carbonizing works.

When mixing concrete in cold weather, apply heat before mixing, or chunks of frozen concrete as hard as rocks may get into the mixer. The heat should be applied immediately before using, and this may be done by discharging live steam directly into the mixer or by having a machine that can be heated under the drum.

The distributing and accounting of detonators is an important feature, and a reliable person should be appointed to look after this. He should keep such record as will enable him to account for every detonator in the mine, and at the end of each firing shift, should check up his account and report any that may be left over.

When the ventilation is not separated into splits, those upon the intake get too much air and, so far as they are concerned, the velocity would certainly be too great. On the other hand the workmen near the return use the air polluted by the breathing of the men and horses, lamps, and the gases that escape from the workings.

Where the roof is hard and the bottom a soft fireclay, all timber should rest on short planks, or, if these are too expensive, slabs laid face down may be used. Where the bottom is hard and the roof friable, very large caps should be used in order to cover as much space as possible; if there are slips visible, see that the cap crosses them.

While 25 years ago, the producer-gas plant was unknown in this country, there are now about 500 such installations, some of which have a capacity of between 5000 and 6000 hp. When used with low-grade coal, which would otherwise be worthless, the producer plant will effect a recovery of 10 to 16 per cent. of the total contained energy.

The "Lives of Famous Engineers" says: "The first Geordie lamp was proved as to its safety on Oct. 21, 1815; 14 days after, Stephenson's second lamp was similarly tested and found to be not only as safe as the first, but also of greater illuminating power. On Nov. 9, 1815, the first Davy lamp was shown in London, at a meeting of the Royal Society."

Capillary attraction often results in the breaking of the roof. After the cover has been dried by the ventilating currents and then resaturated with water, capillary attraction often recharges the vesicles of stone and if the temperature should be raised, the expansion of the water due to the increase of the heat shatters the rock, breaking the timber and thus causing falls of roof.

The ideal safety lamp is one that cannot ignite an explosive mixture outside of itself. Possibly a lamp answering this description would be a source of danger, as even the "ideal" lamp to be safe would have to be used by "ideal" men, and they do not exist, any more than do "ideal" lamps. In the meantime, it may be good policy to see to it that the ventilation is the most favorable to safety.

Before reversing a mine fan when a fire has broken out, consider if changing the current from a positive to a negative pressure will short-circuit the air at the doors, or if the current will be diverted onto open lights. While it is most generally believed advisable to have reversible fans, it is well to confine the area, in which reversing takes place, to as limited a territory as possible, and accomplish same with the utmost speed.

On entering old workings where the ventilation has been cut off, any firedamp present will be found next the roof and the air beneath it, showing that diffusion can only proceed within definite limits. Given unlimited diffusion, explosive mixtures will be found, not only near the roof, but at the bottom as well. From safety-lamp observations, Tate estimated that the limit of diffusion of firedamp is reached when the mixture becomes 97 parts air.

There is a method of working used in the South Wales coal field known as the "double road stall system." In this system, as applied at the Caradog Vale colliery, two roads are turned 14 to 16 yd. apart, and driven a few yards to the rise of the seam, when a connection is made between them, and the "face" thus formed is then worked on. The brushing is packed between the stall roads to assist in keeping up the roof and to carry the ventilation to the face.

It is well to emphasize the importance of making a thorough and careful inspection of wire-rope guides, and the danger of relying merely upon an external examination of them when in their usual dirty and greasy condition. It is, of course impracticable, and would be unwise, to remove the grease along their entire length; but there should be no practical difficulty in thoroughly cleaning short portions at intervals, so as to enable the examiner to ascertain to what extent the individual wires have been worn. In point of fact, this is already done at many large collieries.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Does Moisture Aid Exploding Methane?

In answer to your questions, may I say that if I am quoted anywhere as asserting that an "explosion is impossible in an absolutely dry atmosphere" (and you assure me that this statement is attributed to me and can be found "almost anywhere"), I can only think, regretfully, that a large part of my life has been lived in vain.

In 1876, I discovered that a certain gas, carbon monoxide, would not explode when mixed with air or oxygen if the mixture was well dried; but that a small addition of steam, of hydrogen or of a hydrogen compound rendered the mixture explosive. I showed that the velocity of the explosion of carbon monoxide and oxygen increased with the addition of steam until about 5 per cent. of aqueous vapor had been added.

Many Substances Ignite With Difficulty in Dry Oxygen

This led me, in conjunction with my students, to work on combustion in dried gases, and Dr. Brereton Baker particularly distinguished himself by the careful experiments, in which he showed that it was very difficult to *start the ignition* of many pure substances in dried oxygen. As a result of this work, some theoretical chemists published their conviction that no chemical action was possible between two pure substances without the intervention of water.

I was never able to agree with their conviction; on the contrary, I have accumulated a mass of experimental evidence which seems to me to disprove it. Though some mixtures of gas are harder to ignite when dry (e.g., a mixture of hydrogen and chlorine, or a mixture of hydrogen and oxygen), nevertheless a spark will determine their explosion, however perfectly they have been dried; and once the flame is started the explosion is propagated with greater rapidity through the dry mixtures than when moisture is present. All hydrocarbons, so far as I know, behave like hydrogen in this respect. When they are mixed with air or oxygen, a spark or a flame will fire all of them.

Carbon Dioxide Not Formed Directly in Mine Explosions

Gases containing carbon combined with hydrogen, such as methane, ethane, ethylene, acetylene, etc., or carbon combined with other elements, such as cyanogen and carbon disulphide, do not give carbon dioxide as the direct product of their explosion with oxygen. The carbon burns to carbon monoxide (sometimes with the formation of an intermediate product), and this only burns slowly to carbon dioxide as the flame cools down. It is possible that the temperature in the "explosion wave" of such gases is above the temperature of dissociation of carbon dioxide, so that this gas cannot be formed *in* the explosion wave.

If so, this might account for the non-explosion of dry carbon monoxide and oxygen. In the presence of moisture, the carbon monoxide takes the oxygen from the steam, forming carbon dioxide of comparatively low temperature. The liberated hydrogen reforms steam with the free oxygen, and the steam reacts with more carbon monoxide, and so on.

Methane (firedamp) will explode (when mixed with air or oxygen) under the influence of a spark, and the propagation of the flame is only hindered by the presence of water vapor. It seems probable, as Prof. W. A. Bone has shown, that steam and formic aldehyde are the first products of the burning, and that the aldehyde breaks up into carbon monoxide and hydrogen:

$$(1)\ CH_4 + O_2 = CH_2O + H_2O$$

$$(2)\ CH_2O = CO + H_2$$

Then carbon monoxide and steam would react until an equilibrium was reached:

$$CO + H_2O \rightleftharpoons CO_2 + H_2$$

Ethane, C_2H_6, probably burns in a similar way.

Harold B. Dixon.
British Home Office Experimental Station, Eskmeals, Cumberland, England.

Reducing Ventilation When Firing

I was much interested in the letters published some time since, in regard to reducing the ventilation before firing, in mines. I fail to see any reasonable grounds for anyone recommending that the ventilating current, in a mine, be reduced at firing time.

There are many things to be considered in this connection, before we can determine the effect that such a practice will have in preventing an explosion or reducing its violence and extent should one occur. For example, the temperature of the air at the working face; the amount and nature of the dust that is held in suspension in the air or that may be blown into the air by the force of a shot; the kind of explosive used and the flame produced in blasting; the size of the working places; the friability and inflammability of the coal; and the amount of gas given off and carried in the return air current. All of these have their effect on the occurrence and the character of an explosion.

We meet with different conditions in different parts of the same mine and in different mines. While some workings are wet, others are dry and dusty; some generate gas and others none. If these conditions were alike in different mines, we might be able to determine the amount of air necessary to be kept in circulation in order to control the strength of an explosion should one occur.

A mine is never safe unless there is a sufficient amount of air kept in circulation to properly dilute and carry off the gases that are generated at the working face, whether these gases are produced by blasting or escape from the coal. If the velocity of the air at the working face is low, or, as we say, the air is sluggish the danger of explosion is much increased. The velocity of the current should not be too high, however, but only sufficient to sweep away the gases that would accumulate. I consider it more important to adopt measures that will *prevent the ignition* of gas and dust, at the working face, rather than to consider what will *reduce the strength* of an explosion, after it has begun. When an explosion has once started we cannot tell where it will end or what strength it will attain; for we do not know the actual existing conditions in the mine. It may be true that the higher velocities of the air current will carry a larger amount of dust and feed the flame and cause it to be transmitted through parts of the mine where it would not otherwise be carried; but, at the same time, it must be granted that a sufficient air volume is required, at the working face, to render the mine atmosphere safe and reduce the chances of ignition taking place.

In order to prevent, as far as possible, the occurrence of mine explosions, I would suggest that a sufficient amount of air be kept in circulation at the working face, in all parts of the mine; and that all places where blasting is to be performed should be properly watered; and all fine coal and slack loaded out. I would recommend that permitted explosives be used, in blasting; and not more

than one shot be fired at one time, in the same place; and that each place be examined for gas before a shot is fired therein. No shot should be fired where gas is found in any quantity, and care should be taken that each hole is properly placed, charged and tamped. But one explosive should be used; and the work expected of each shot should be so proportioned, that not more than 1½ lb. of powder will be required in a single charge.

BENJAMIN HARTILL.

Johnstown, Penn.

Ventilation in Pitching Seams

In the pitching seams of the anthracite region the airway is often driven above the gangway and the air conducted to the chambers by a short crosscut or "monkey airway"; and, after passing through the chambers, the air is then conducted back to the gangway, which is thus made the return of that section of the mine.

I have noticed that this system of ventilation brings all the smoke from the chambers down onto the gangway and interferes very much with the work of the drivers in loading the cars and hauling them out of the mine. The gangway or main road is often full of smoke and hot air, and the drivers are prevented from gathering their trips until the smoke has cleared. It is often so smoky in the gangway that they cannot sprag their cars, which is liable to cause a serious accident.

It has seemed to me that a better plan would be to bring the air in on the gangway and carry it up the chambers and into the airway above, thereby making that the return air course. This would not only keep the chambers clear of smoke and enable the miner to get out more coal; but it would greatly assist the work of the drivers, in gathering their trips. Such an arrangement would greatly increase the output of the mine.

In the present arrangement, it is necessary to have a door at the mouth of each chamber; but by changing the system, as suggested, it seems to me doors could be avoided to a large extent, at the mouths of the chambers, which should reduce the expense of working. Instead of having a door at the mouth of each opening, we would have a door on the first opening and then one about every tenth opening on the gangway.

Another bad feature in the present system is that where the mine is making gas, the gas is carried down the chambers onto the gangway, and is liable to be ignited on the lamps of the drivers or of the men coming in to their work. In any mine generating gas, the haulage roads should be made the intake.

A MINER.

Scranton, Penn.

Abandoned Places in Mines

In reference to the inquiries of F. I. Pearce, COAL AGE, July 27, p. 127, and John Sutton, Aug. 3, p. 161, asking for the best method of dealing with abandoned places, I want to say that all abandoned workings, in mines, should be kept ventilated as long as possible. When it is no longer practicable to ventilate them, owing to falls of roof and other obstructions, they should be closed tight by building substantial masonry or concrete stoppings in all openings leading thereto. The work of building these stoppings should begin at the return end of the district and continue in order to the intake, which should be closed last. No abandoned place, in a gaseous mine, in my judgment, should be sealed off without providing one or more good relief pipes that will conduct the gases accumulating behind the stoppings, either into the return airway or to the surface. When these relief pipes lead to the return airway, it is a good plan to provide them with suitable valves that can be closed in case of need. I would make these pipes 5 or 6 in. in diameter. In some cases, drill holes can be sunk from the surface, so as to drain the gas from the abandoned places. When this is done the drill holes should be located in a position to tap the abandoned place at its highest point, where the gas will accumulate. If the gas is allowed to escape into the return airway, no open lights should be allowed on the return air and the relief valves should be in charge of a competent and reliable person, generally the fireboss.

The necessity for installing relief pipes when sealing off abandoned places is to prevent the accumulation of a large body of gas, under high pressure, behind the stoppings. If this is not done, the accumulated gases may attain a pressure that would be dangerous and cause the destruction of the stoppings and the sudden outflow of a large body of explosive gas.

Mr. Pearce asks if this is the practice in many mining states. I would say in answer to his question: Yes, there are many mines where this is done; but, as far as my knowledge goes, in most cases, no relief pipes are provided for the escape of the accumulated gas. This omission seems to me dangerous practice.

Replying further to Mr. Sutton's question, I would suggest that, under the conditions named, all timber in the abandoned area should be drawn, and the place allowed to cave, as far as it will. It may be of advantage to put one or more shots in the roof, in order to start the caving. The remaining small area should be thoroughly ventilated, and proper precautions should be taken to prevent the accumulation of gas over the falls. I think this plan would be less expensive and safer than to build stoppings and seal off the area.

When the plan is adopted of ventilating an abandoned area, the air current from the place should be conducted, if possible, at once into the main-return airway and carried out of the mine. I consider that the sealing off of abandoned places, in a gaseous mine, should be the last plan considered.

Gatliff, Ky. J. C. BABB.

Blownout Shots

One of the most frequent causes of mine explosions is the occurrence of a blownout shot. The flame of the shot often extends a long distance in the airway and ignites the fine coal dust scattered on the roads and timbers.

I was called to a mine about four months ago to examine a blownout shot. I found that the hole had been drilled 5 ft. 9 in. on the solid. In the entry I found traces of smoke and flame, a long distance from the place where the shot was fired. The dust had been burnt off the coal on the rib or side of the entry. There was a coat lying at the side of the road, 378 ft. from where the shot was fired. The coat was burned to ashes, except a small piece about 2 in. square. I took this as evidence that the flame had extended at least to this point in the entry.

The frequent occurrence of blownout shots, in mines, is largely due to the demand for cheap coal. The operator is often compelled to compete, in the market, with coal that is sold at a figure below his cost of production. To meet these conditions a larger daily output of coal is demanded, and the miner, on his part, does not allow himself time to put in a "cutting" or a "mining." Instead of this, he drills a deep hole in the best place he can find, in the face of his breast, and puts in an extra charge of powder, which he believes will do the work. Sometimes it does, but often the result is a blownout shot that may cause loss of life or injury to property or both.

I believe that many explosions are caused by the firing of two or more shots, at the same time, and the gas and dust of the first shot being ignited by the flame of the second shot. I think, also, blownout shots are caused, at times, by a mixture of black powder and dynamite being placed in the hole. I consider it dangerous to mix these explosives, in blasting coal in mines.

The three principal causes that lead to dust explosions are, therefore, in my mind: (1) the demand for cheap coal; (2) the greed and inexperience of the average miner; (3) the general disregard of the mining law and mine regulations.

JOHN SUTTON,
FIREBOSS.

West Terre Haute, Ind.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Examination Questions

TIMBERING

Ques.—What load will break a white-pine beam 10x12 in. and 14 ft. clear span? Assume the beam is supported at both ends and uniformly loaded.

Ans.—For a rectangular beam, multiply the square of the depth by the breadth and divide this product by the length of the beam, all in inches. The quotient obtained is what is called the section modulus of the beam. Multiply this by the fiber stress of the material. For white pine, the fiber stress is 7500 lb. per sq.in. For a beam supported at both ends and uniformly loaded, the breaking load is four-thirds of the product last obtained.

For example, the breaking load of the beam, in this case, is

$$\frac{4}{3} \times 7500 \frac{10 \times 12^2}{(14 \times 12)} = 85{,}700 \text{ lb.}$$

Ques.—Using a factor of safety of 6, what is the safe load the beam mentioned in the last question will support, supposing the entire load to be concentrated at the center of the beam?

Ans.—The center load a beam will support is always one-half the uniformly-distributed load. Therefore, in this case, the beam would be broken by a center load of 42,850 lb. Using a factor of safety of 6, the safe center load would be, in this case, say 7140 lb.

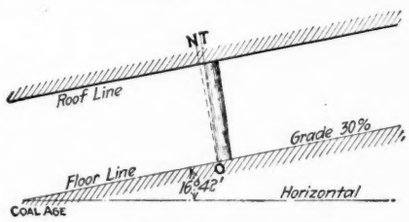
Ques.—What is the crushing load of a post 8 in. in diameter at its small end and 10 ft. long, assuming the post to be set vertical?

Ans.—This post will bend before it will crush; because a post in a mine presents practically equal resistance to crushing and bending when the diameter of the post at its small end, expressed in inches, is equal to its length, in feet. When the smaller diameter of the post, in inches, is greater than its length in feet, the post will crush before it will bend.

For example, assuming this is a hemlock post and measures 10 in. on the butt, which would make the average diameter 9 in., the post would bend under a load of practically 270,000 lb., while it would require a load of 286,000 lb. to crush the smaller end.

Ques.—How would you set a single post on a pitching seam?

Ans.—When the pitch of the seam is considerable, say above 10 deg., the post must be "underset," that is to say, inclined up the pitch, the amount depending upon the inclination of the seam and the tendency of the roof to slip.



SHOWING MANNER OF UNDERSETTING POST TIMBER ON STEEP PITCHES

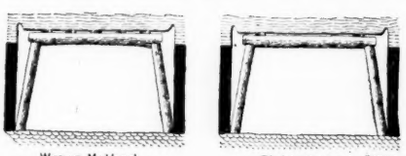
Fig. 1 shows a post underset, in a seam pitching 30 deg. The line N O being normal, or perpendicular to the roof and floor of the seam, the angle N O T is the angle the post is inclined up the pitch. This angle increases with the inclination of the seam and the tendency of the roof to slip down. The purpose of undersetting a post, in an inclined seam, is to avoid the loosening of the post when the roof slips.

Ques.—What is meant by the expression "double timber", in mine timbering?

Ans.—This term is used to describe a timber frame, consisting of two legs and a crossbar or collar, in distinction from post timbering.

Ques.—Make a sketch of a timber set, showing how you would wedge it, and give reasons for the method you suggest?

Ans.—In Fig. 2 is shown the wrong and the right way of wedging a timber frame. In the wrong method, shown on the left, the wedges are spaced equal distances apart, the entire length of the crossbar.



WEDGING A TIMBER SET

The purpose intended, in this arrangement, was to distribute the roof pressure uniformly on the crossbar; but the sagging of the roof, which always follows the extraction of the coal, brings the heaviest load on the center of the bar when wedged in this manner. The method shown on the right, in which but two wedges are used, driven one on each side, a few inches inside of the leg, throws the pressure on the legs and overarches the weight. This relieves the weight on the center of the bar, and preserves the life of the timbers.

Ques.—In order that a post may present equal resistance to crushing and bending, what rule would you use to determine the size or diameter of the post?

Ans.—Make the small diameter of the post, in inches, equal to its length, in feet. This rule applies to all classes of mine timber.

Ques.—When would you consider a prop to be well stood, in a flat seam?

Ans.—In a flat seam, the post should be set vertical or perpendicular to the roof and floor of the seam. In order to prevent the post being destroyed by the first settlement of the roof, which always follows the extraction of the coal in the chambers, the post should not be wedged too tight, especially if the roof or floor is hard. With a hard roof or floor, a good plan is to use a soft-pine cap of considerable thickness, over the post. When the roof "weights," the head of the post will crush into the soft cap, which binds the top and prevents the "furring" of the post. When setting the post under a soft roof, it should be provided with a broad strong cap, so as to distribute the roof pressure as much as possible. With a soft floor, a footboard should be used. A common practice with a hard floor is to set the post on a mound of dirt, which yields when the post "takes the weight." If these precautions are not taken, the post will be destroyed.

Ques.—Describe how you would timber an entry where the roof alone needs support.

Ans.—A common practice, where the coal is hard, is to cut hitches in the coal close to the roof for the support of the cross-beam or collar. In this method, no legs are used. One end of the cross-beam is inserted in the hole cut in one rib, and the other end is then slid into the hitch cut in the opposite rib. In cutting the hitches, it is necessary to provide for the entering of the crossbar in this manner.

Ques.—Where the roof is frail and the ribs are weak and tend to fall, how would you timber the entry?

Ans.—In this case, the timber frame is set up in the usual manner, but providing sufficient room above the timbers and behind the legs at each side, to allow the insertion of "lagging" behind the timbers. This lagging consists of light poles run in behind the legs and above the collars, for the purpose of preventing the dirt from the roof and sides, falling into the roadway and, incidentally, giving support to the roof and sides of the entry.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Evidence that the Miner Resists Tuberculosis

By Jonathan M. Wainwright* and Harry A. Nichols†

The largest collection of statistics bearing on this matter is probably that of the United States Census for 1900. In classifying deaths according to occupations, it is unfortunate that the census bureau groups all miners and quarrymen together. On this account it is impossible to get accurate figures which will cover the whole United States and which relate to coal miners alone.

However, it is to be remembered that all authorities consider colliers the healthiest of miners, and all agree that stone dust is much more injurious to health than the dust of coal. It is, therefore, unquestionably true that the figures for coal miners alone would be more favorable than those for all miners and quarrymen combined.

Miners Near the Foot of the List

The following comparisons of this class with others must, therefore, be read with the knowledge that the comparison for coal miners alone would be more favorable still. In the 60 occupations classified in the census of 1900, miners and quarrymen occupy the fourth place from the bottom, in point of view of tuberculosis mortality.

Three classes are omitted in the list, to wit: (1) Stock raisers, herders, and drovers, (2) clock and watch repairers with jewelers, and (3) commercial travellers. It would not be well to place these in the list as the numbers enumerated are too small to assure that the results are typical.

The three classes which have a lower mortality rate are: (1) Farmers, planters and farm laborers, (2) lumbermen and raftsmen and (3) bankers, brokers and officials of companies. The rate of death from consumption for miners and quarrymen per 100,000 living in the occupation is 120.9.

Comparing this with a few of the presumably more healthful occupations, we see that the rate for lawyers is 139.9, for physicians and surgeons 168.8, for carpenters and joiners, 231.0; for draymen, hackmen and teamsters, 261.4; and for sailors, pilots and fishermen, 333.0. The highest in the list are marble and stone cutters, with a rate of 540.5 per 100,000 employed.

The rate for outdoor laborers, in which miners are grouped, is 147.

TABLE I. MORTALITY FROM TUBERCULOSIS IN 1900 PER 100,000 WORKMEN

PATION	
Marble and stone cutters	540.5
Cigar makers and tobacco workers	476.9
Plasterers and whitewashers	453.3
Compositors, printers and pressmen	435.9
Servants	430.3
Hat and cap makers	415.3
Bookkeepers, clerks and copyists	398.0
Laborers (not agricultural)	370.7
Tinners and tinworkers	365.3
Cabinet makers and upholsterers	359.1
Musicians and teachers of music	349.8
Glassblowers and glassworkers	342.5
Barbers and hairdressers	334.9
Sailors, pilots, and fishermen	333.0
Painters, glaziers and varnishers	319.3
Leather makers	311.4
Apothecaries, pharmacists, etc	305.5
Coopers	299.5
Plumbers and gas- and steam-fitters	294.0
Masons, brick- and stone-	293.9
Butchers	287.7
Saloonkeepers, liquor dealers, bartenders, and restaurant keepers	285.6
Livery-stable keepers & hostlers	267.5
Draymen, hackmen, teamsters etc	261.4
Boatmen and canalmen	256.8
Brewers, distillers and rectifiers	256.8
Janitors and sextons	251.4
Hucksters and peddlers	250.9
Bakers and confectioners	250.1
Iron and steel workers	236.2
Carpenters and joiners	231.0
Engineers and firemen (not locomotive)	229.7
Leatherworkers	227.3
Tailors	218.2
Blacksmiths	212.9
Hotel and boarding-house keepers	210.3
Mill- and factory-operatives (textile)	207.6
Flour and grist millers	198.5
Machinists	195.9
Architects, artists and teachers of art	188.9
Journalists	188.4
Gardeners, florists, nursery men and vine growers	186.6
Physicians and surgeons	168.8
Merchants and dealers	163.8
Engineers and surveyors	145.1
Teachers in schools	144.0
Lawyers	139.9
Policemen, watchmen and detectives	136.7
Boot and shoe makers	135.5
Soldiers, sailors and marines (U.S.)	134.7
Collectors, auctioneers and agents	131.2
Steam railroad employees	129.8
Clergymen	123.5
Miners and quarrymen	120.9
Farmers, planters and farm laborers	111.7
Lumbermen and raftsmen	107.1
Bankers, brokers, and officials of companies	92.1

Low Proportion of Deaths from Tuberculosis

In the whole United States, consumption caused 9.7 per cent. of all deaths among miners and quarrymen, as against 14.5 per cent. for all occupied males, and as against 11.2 per cent. for the outdoor group of workers. The figures for miners and quarrymen are based on a return of 5895 total deaths from all causes.

According to this statement, therefore, consumption is nearly one-third less frequent among miners and quarrymen than among other occupied males.

The English Evidences of Low Tuberculosis Rate in Coal Mines

In England, statistics point with equal strength to a diminished tuberculosis mortality among miners. Tatham[1] presents a very succinct statement of the case, based on figures from the Registrar-General's office for 1890 to 1892.

These English statistics show that the relative figure for deaths from phthisis among coal miners is only 97, as against 109 for all classes of miners (iron, copper, tin, lead, etc.), as against 115 for farm laborers, and 185 for all occupied males.

Parry[2], from English figures on more or less dusty occupations, gives the following Table 2 of relative mortality, in which coal miners stand lowest not only in regard to consumption, but also in regard to all other diseases of the lungs. In both respects they stand lower than all occupied males. We regret that we have not been able to find any large collection of French and German statistics.

TABLE II. PARRY'S TABLE OF RELATIVE TUBERCULOSIS MORTALITY IN ENGLAND

Occupations	Relative Mortality Figures		
	Consumption	Other diseases of lungs	Total lung diseases
Coal Miners	126	202	328
Carpenters and joiners	204	133	337
Plumbers, painters and glaziers	246	185	431
Masons, builders and bricklayers	252	201	453
Wool manufacturers	257	205	462
Cotton manufacturers	272	271	543
Quarrymen, stone and state workers	308	274	582
Cutlers	371	389	760
Filemakers	433	350	783
Earthenware makers	473	645	1118
Tin cornice makers	690	485	1148
All males, England and Wales	220	182	402

Sweeps, coal heavers and trimmers are given higher figures than coal miners.

Anthracite Mining and Tuberculosis

In order to get some first-hand information in regard to the anthracite mine workers of the United States as a class, we have examined the death certificates filed with the Scranton Bureau of Health during a period of ten years, and have worked out the percentage of deaths from various causes, the average length of life, etc., among miners, as compared with other occupied males.

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*Chief Surgeon, Moses Taylor Hospital, Scranton, Penn.

†United States Medical Corps, Washington, D. C.

Note—Continuation of article on "The Relation between Anthracosis and Pulmonary Tuberculosis," read before the Lackawanna Medical Society, Baltimore. The first section appeared Aug. 3 and is entitled "Coal Miners and Tuberculosis."

[1]In Oliver's "Dangerous Trades," London, 1902.

[2]Parry, "Risks and Dangers of Various Occupations," London, 1900.

The years covered were those between 1894 and 1904, including both terminal years, but excluding 1902, the year during which occurred a long strike, which lasted over five months. A short strike of a little over a month in 1900 was ignored. With a general population of a trifle over 100,000 people, Scranton has had during the above period, 857 deaths among miners, and 2656 deaths among other occupied males.

In each case the actual certificate of the physician was used for the compilation of our figures, and only complete certificates were accepted for that purpose. Aside from the ever-present possibility of mistaken diagnosis, there are two special circumstances which make our results suggestive rather than mathematically absolute.

In the first place, many certificates were excluded as incompetent, and a slight error may have crept in from this fact. It is fair to assume that the exclusion affects both groups to the same degree. Secondly, the occupation in many certificates is only given as "laborer," and it is possible that some mine laborers were so designated.

On going over the certificates we came to regard this possibility of error as slight, because mining is such a distinctive occupation that we either found special reference made to it, or else the context showed the exact occupation. With these explanations, we submit our statistics as follows:

TABLE III. PERCENTAGES OF DEATHS FROM VARIOUS CAUSES AT SCRANTON, PA. 1894-1904.

	Pulmonary Tuberculosis	Asthma	Pneumonia	All lung diseases	Trauma*
Anthracite mine workers (857 deaths)..	3.37	7.0	10.96	23.45	45.57
All other occupied males (2656 deaths)	9.97	1.58	13.85	27.86	14.15

*Trauma includes all kinds of violence from a scratch of a pin to a death-blow from a sledge hammer.

Equating the percentage of deaths from all lung diseases among miners to 100, the relation is as in Table 4:

TABLE IV. RELATIVE SUSCEPTIBILITY OF ANTHRACITE MINERS AND OTHERS TO VARIOUS FORMS OF LUNG DISEASE

	All lung Diseases	Pulmonary Tuberculosis	Asthma	Pneumonia
Anthracite mine workers.....	100	14	29	42
All other occupied males.....	114	41	7	54

From our own figures in Scranton, it would seem that tuberculosis is about two-thirds less frequent among anthracite-coal miners than among all other occupied males. By taking our figures of 3.3 per cent. as the proportion of all deaths among miners due to tuberculosis and comparing it with the census figures for the whole United States, we get the following table:

TABLE V. RELATIVE PROPORTIONS OF MINERS AND OTHERS DYING FROM TUBERCULOSIS

	Percentage of all deaths due to consumption
Anthracite mine workers.....	3.3
Miners and quarrymen, whole of United States.....	9.7
Out-of-door laborers.....	11.2
All occupied males.....	14.5

It is of interest to note, that the average age of death in anthracite-mine workers from all causes is 42.89 years, as against 46.36 years for all other occupied males in the same city. The average age at death from trauma is 34.15 years among the miners, and 36.05 among all other occupied males.

From causes other than trauma, the average age at death is 49.93 for miners as against 48.05 for other occupied males. In other words, if we exclude trauma, miners live slightly longer than all other occupied males in the same city.

Conclusions of Belgian Pathologists

As early as 1863, Kubon[3] said, "that coal dust is unable to cause pulmonary tuberculosis or even to favor the evolution of preëxisting tubercules. It prevents the development of phthisis." DeCrocq[4], of Belgium, in 1862, said that several physicians had noted the rarity of consumption among coal miners.

German Views on Miners' Immunity

In Germany, Arnold[5] says: "It has been noted that among miners tuberculosis diseases are very rare. It has even been considered that there is an antagonism between anthracosis and tubercular disease."

Arnold disclaims any personal experience in the matter, but considers that if there is any action it is due to the fact that the deposits of dust prevent the spread of the poison. He does not believe that there is a direct action of the dust on the bacteria.

Seltman, quoted by Bürger[6], found tuberculosis a rare disease both in old and young miners. He also announced that coal dust exerts a favorable influence on any tuberculous process which may be already present. He says that many physicians have treated tuberculosis of the lungs by the inhalation of coal dust.

Goldman[7] says that tuberculosis is a rare disease among coal miners. He says it causes only 1 per cent. of deaths among them. This he attributes to an antiseptic action of the dust. Goldman quotes Hirt, who, in 4000 cases of pulmonary tuberculosis, found that 22 per cent. had been subject to various kinds of dust, 11 per cent. had been subject to coal dust.

The Female of the Species More Subject Than the Male

Goldman says that tuberculosis is more prevalent among miners' families than among the miners themselves. Basing our opinion on the service of over four years in a large miner's hospital, and also on a somewhat close study of the tuberculosis problem in the largest anthracite center in the United States, Scranton, we most decidedly agree with Goldman in the statement.

Dirksen[8], of Germany, says that coal workers have the best health of all men having dusty occupations. He says that in Upper Silesia only 0.9 per cent. of all internal diseases among coal miners are due to tuberculosis. He says that many claim that coal miners are immune from that disease.

English Authorities

In England, Oliver[9], of Newcastle-upon-Tyne, who is one of the greatest authorities on occupational diseases, draws a sharp line between lesions due to dust and those due to tubercule bacilli.

He does not give much attention to the relative action of one on the other. He does say, however, that "ventilation of the British coal pits has practically abolished pulmonary consumption among our miners."

Trotter[10], a practitioner in an English coal field, says: "As a disease, phthisis is probably more uncommon among coal miners than among any other class of workers. I am inclined to believe that the comparative rarity of consumption among coal miners is largely due to the protective influence of coal dust or soot."

He considers this partly a mechanical action, due to the coal dust and soot clinging to and covering the sharp angles of the mineral matter inhaled and "to a lesser degree to an antiseptic and deodorant action."

He says that "the death returns from phthisis in a colliery district show a greater proportion of deaths among females than among males; (see Goldman's and our own opinion above). "Colliery surgeons almost invariably state that phthisis is not so common in mining sections as in other districts in which they have practised."

[3]Kubon. Du Role Pathologiques des poussières dans les organes respiratoires des ouvriers des mines. Bull. de l'acad. de med. Belgium, 1863.

[4]DeCrocq. De l'anthracose pulmonaire, Bull. de l'acad. de med. Belgium, 1862.

[5]Arnold. Untersuchungen über Staub Inhalation und Staub Metastasen, Leipsic, 1885.

[6]Bürger. De beziehungen der tuberculose zu der anthracose, Marburg, 1903.

[7]Goldman. De Hygiene des Bergmannes, Halle, 1903.

[8]Dirksen. Quantitative Staub bestimmungen der luft de Kohlen bunker. Archives für Hygiene, 1903, No. 11.

[9]Miner's Phthisis. "British Medical Journal," Sept. 12, 1903.

[10]Trotter. The so called Anthracosis and Phthisis in Coal Miners. "British Medical Journal," May 23, 1903.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The Interstate Commerce Commission has further suspended from Sept. 3, 1912, until Feb. 28, 1913, items contained in supplements to southern railway tariffs which cancel existing joint rates for the transportation of coal from mines on the Stony Fork branch of the Louisville & Nashville R.R. to various destinations in the southeast. This order is made in further pursuance of the announced policy of the Commission in suspending rate increases on coal, wherever they may be undertaken. The Commission has admittedly embarked upon the policy of holding rates at their present figures, pending the development of evidence to show that the roads have positively entered upon a period of higher fixed and current charges.

In other words, it is understood that there are to be no more advances in coal unless they are necessitated by the arrival of a higher scale of wages, such as is demanded by the men who are now urging arbitration proceedings. If their demands should be granted, and the roads should succeed in making out a case before the Commission on the strength of these larger outlays the result might be an advance in rates by permission of the Commission. But in the absence of this, or some other general advance, the policy is to be as indicated.

Coke Investigation

Attorney General Wickersham has begun a long expected investigation by starting an inquiry into coke interests in the Connellsville region. He wants to find out if there is there a combination of advance prices for the commodity that might be held to be in violation of the Sherman anti-trust law. From time to time, for a good many months past, the Department of Justice has received complaints to the effect that certain classes of coke were being unduly advanced.

Not very long ago an inquiry was made by some large consumers of coke at their own expense, and the results were brought to Washington and placed before the Department for examination by the attorney general. There was enough colorable ground for the complaints to warrant the Department in opening the investigation. Hence, the present undertaking. The idea is to show that there has been a combination of producers for the purpose of establishing a uniform rate on coke, and then to get evidence establishing that this combination has practically suppressed competition in the article. The action of the Department of Justice is in line with the policy of the government as exemplified in the pending investigation which is to be conducted by the Department of Commerce and Labor with respect to the monopolization of coal and the passing on of wage increases to the consumer in the form of higher prices. This latter inquiry is already being pressed with considerable activity. It is believed that the results of the inquiry will be in the hands of Congress by the opening of the session and that, as a result, legislation of various sorts will be proposed.

An Industrial Commission

In line with the investigation mania which has taken possession of congress, is the proposition for an industrial commission which was adopted by Congress this week and sent to the President. No one doubts that it will be signed and become law. Then the President will have the appointing of the nine members of the Commission and will do so at once. It is understood that a prime purpose of the creators of the commission is to secure an investigation into the relations of labor and capital, not only in the iron and steel industry but also in all lines, and particularly in the coal business.

In all probability, one of the members of the commission will be a man familiar with, or able to speak in some measure for, the coal interests of the country and acceptable to the employees. A main reason for the appointment of the commission is that there is a strong feeling concerning the apparently strained relations that are said to be gaining ground between the men and the employers in the coal industry, as well as in the iron and steel business. This will lead to some investigations in continuation of those which were prosecuted by the anthracite coal strike commission some years ago.

The Alaska Coal Fields

As a result of provisions in appropriation bills, it is probable that a complete survey of the coalfields of Alaska will be undertaken at an early date by agents of the Bureau of Mines for the purpose of better determining the legislative policy to be followed with respect to that territory. Much legislation has been proposed for Alaska, but there has been hesitation about acting, in view of the obvious fact that very few members of Congress were really familiar with the problems of the territory. It is believed that the next two years will witness some extensive legislation on coal questions and particularly some affecting the status of mining in Alaska.

Alabama

Birmingham—The demand for coal in Alabama is sufficient to warrant a steady operation of the mines, and efforts should be made to increase the output. Future prospects are bright and give encouragement to those contemplating the opening of new mines.

Coke is in strong demand, both the beehive and the byproduct varieties. The Tennessee Coal, Iron & R.R. Co., is adding batteries at its big plant at Corey.

While a change in the big gas main was being made at the Corey byproduct coke ovens of the Tennessee Coal, Iron & R.R. Co., the gas was ignited and a terrific explosion followed. Seventeen men were seriously hurt. Little damage, however, was done to the property.

A local explosion in the Abernant mine, on Aug. 13, caused the death of 17 colored miners. The inspector claims that, if a large number of victims had not lost their senses after the explosion, they could have escaped, since the fans of the mine were not placed out of commission. One negro did manage to get away, and 24 hours after the explosion another negro was found alive in the mine

Arkansas

Fayetteville—Coal in considerable quantities has been discovered on farms near Fayetteville. It seems that there are evidences of oil in that region, and a company has been drilling for it. At a depth of 190 ft. a 10-ft. bed of excellent peacock coal was struck and at 130 ft. a bed of granite was found. The company is making further drills and will go to a depth of 1400 ft. in the hope of striking oil.

Illinois

Danville—The Mission Mining Co., operated by the Hartshorn Bros., resumed work, Aug. 7, after an idleness of one month. The mines are composed of a strip bank, known as No. 1, and two slopes, Nos. 2 and 3.

The slopes will not be opened immediately, because of a disagreement between the operators and miners. When both slopes and the strip bank are running at full capacity, considerably more than 100 men are employed.

The dullness of the coal market is the reason that is given for the shut-down. The disagreement, however, between the miners employed in the slopes and the operators arose over placing of the crossbars in various entries and rooms. The company expected the miners to do this without extra pay.

Lincoln—The manager and owners of the Citizens Coal Co. have decided to resume operations Sept. 1. The company realizes that there is no demand for coal, and, as the miners were not disposed to return to work in July, the company will keep the mine in condition until September, when it is expected that different arrangements will be inaugurated beneficial to the company.

Mt. Olive—After having been shut down for a week, the No. 15 mine of the Consolidated Coal Co., resumed operations, Aug. 2.

The cause of the shut-down was a bad fall of rock in one of the entries. After the slip had been cleared up, a considerable amount of new timbering had to be done.

Shelbyville—The mine at Tower Hill, has been sold by the Century Coal Co. to a newly incorporated concern known as the Tower Hill Coal Co.

Taylorville—Coal has been struck near here at a depth of 405 ft. The bed is 8 ft. thick and it is expected that options will be secured in the near future.

Indiana

Brazil—The new mine of the Crawford Coal Co., west of this city, is near completion and will soon be ready for operation. A force of workmen is now laying the switch which connects the mine with the B. &. E. I. R.R.

Hymera—After spending three days investigating the conditions at three mines of the Consolidated Coal Co., officers of District No. 11 have decided to call a strike. The operators have forbidden the use of the carbide lamps for drivers on the ground that they are too easily extinguished and are, therefore, dangerous. Several of the drivers who continued to use these lamps after the order was issued were laid off. About 800 miners are involved.

Jacksonville—The City Coal Co. has struck a 5 ft. 3-in. bed of coal at a depth of 41 ft. All the machinery for the mine has been set and coal will be hoisted in a few days. The company will cater to local trade only.

Jasonville—It has been reported that the Island Valley mine will resume work Aug. 19. This mine has been idle about a month and employs 200 men. All the operators in the field are anticipating a heavy fall business.

Iowa

Dallas—The Consolidated Indiana Coal Co. has recently opened a large shaft near this city. The main shaft is elliptical in shape, about 15 ft. across, at its widest part, and 185 ft. deep. It is built of steel, lined on the inside with reinforced concrete, and is waterproof.

All of the frame work and casing is of steel. The latest machinery will be installed as soon as the mine is in operation.

The air shaft of the mine is built on an incline, which is not so steep but that miners can walk down. This saves the main shaft for hoisting coal alone, and makes two complete and safe exits for the miners in case of accident. A large 12-ft. fan will force fresh air down the incline shaft, and a track will also be laid down the incline so that the coal can be drawn up if necessary, or other material hauled up or taken down.

The main shaft and air shaft are both completed, but the overhead works are not yet finished. Mr. Reece is the engineer in charge.

Des Moines—The Keystone Coal Mining Co., owned by John and Andrew Mackey, has been sold to T. W. Carpenter. The mine is located on West Grand Ave., near Valley Junction, and is one of the best small mines in the city, having a daily capacity of from 150 to 200 tons of coal.

Kentucky

Jackson—The Louisville & Nashville R.R. has laid its new line from here to a point 10 miles east of Hazard. Fifty miles of the construction have been completed, leaving 40 more yet to be finished.

Lexington—The new half-million dollar power house of the Kentucky Traction & Terminal Co., which has recently been put into operation, is equipped with a remarkable system for handling coal. Pits, capable of accommodating 700 tons, are located in the boiler room. A switch from the Belt Line R.R. connects directly into the boiler room over the coal pit, from which coal can be dumped directly from cars into storage. The hoppers are operated by electric cranes, capable of handling 75 tons an hour. Another feature of the plant is an electrically driven coal crusher, which can handle the same number of tons.

Morganfield—The River & Rail Coal & Coke Co. has decided to build a track from this place to the river, and thus permits shipments by water as well as by rail. Work is to be begun at once, and it is expected that the new method of transportation will largely increase the output of the mines in this vicinity.

Roes Run—The third attempt at assassination since the strike in the mines near the Roes Run Iron Works, in Bath County, when unknown persons wounded Allen Spence, Jr. The assailants fired from ambush. Allen Spence, Sr., is heavily interested in the mines.

Michigan

Albion—A new drift of bituminous coal is to be opened by a Jackson mining concern in the near future. Machinery is being hauled to the mouth of the new shaft, and it is expected that coal will be taken from the mine before October. The presence of a rich bed of coal near Albion has been known for some time, but the project of mining it could not be properly financed before.

Montana

The Northern Pacific R.R. will be forced to pay taxes on its coal lands in Musselshell County, unless the courts interfere. Last year the property was assessed at $555,000, which the company refused to pay. The State Attorney General holds that if the railroad reserves the coal and mineral rights, such reservations are taxable and subject to assessment. It is thought likely that the road will take the matter to court.

Helena—The annual state fair at this city will be featured this year by a first-aid meet. The date set is Sept. 23 to 28, incl. Dr. J. A. Holmes has assured that rescue car No. 5 will be on the grounds during the entire week. The National Red Cross Society will furnish trophies and badges for the competing team.

Ohio

Amsterdam—A section of the Ohio & Pennsylvania coal mine was discovered to be on fire on Aug. 6. Fireboss Hodge and his assistants have been working diligently to get control of the flames, but the fire is still raging.

Columbus—The Ohio Public Service Commission has taken up the question of preventing the congestion of coal cars on railroads of Ohio. The commission has called upon railroad men to report what steps they have taken to prevent congestion. It is the purpose of the commission not to repeat the condition of affairs which occurred last year, and tied up the entire coal traffic during February and March.

State Mine Inspector J. C. Davies has appointed Isaac Hill, of Zanesville, as a deputy mine inspector at a salary of $1800 a year. He will have charge of the territory of the Muskingham, Perry and Washington counties.

New Lexington—It has been announced that the Lilly mine, of the Pennsylvania line, will resume operations immediately. The mine is now owned by the Weaver-Duframe Coal Co., of Bucyrus. It is a machine mine, operating in the No. 5 vein of coal.

Pennsylvania

ANTHRACITE

Mahanoy City—In exploring an abandoned breast with naked lamps, at Ellangowan colliery, after quitting for the day, two miners fired a quantity of gas. Both were badly burned and blown down the breast.

Pottsville—Miners who left to seek employment in Canada and also in the soft-coal region, during the suspension which started last April, are coming back daily throughout the anthracite region. The reason is said to be that hard-coal mining pays the best wages and the prospect that every operation will be busy all winter, even to the extent of employing extra shifts, has caused the lively run for home.

Ravens Run—A large breaker of the Girard Mammoth Coal Co., was totally destroyed by fire, together with various adjoining buildings, causing a total loss of $160,000. The culm bank was ignited during the course of the fire.

BITUMINOUS

J. E. Roderick, chief of the department of mines of Pennsylvania, realizing that it is possible for disasters similar to the Lemont flood to occur again, has given instructions to all mine inspectors to guard against them in the future. The following letter has been sent to all inspectors:

In view of the fact that many lives have been lost in the mines of Fayette County, through the floods which have inundated them, I deem it an opportune time to call your attention to the need of looking very carefully after the mine openings in your district to see that water from floods cannot enter to endanger the lives of the employees. I suggest that if you find any such openings, you call the attention of the superintendents to the fact and ask them to have them safeguarded.

Butler—The Western Allegheny R.R. Co. was placed in the hands of a receiver by the court, on Aug. 12, as a result of a bill in equity, filed against the company by H. W. Love.

The railroad is a subsidiary of the Great Lakes Coal Co., which was placed in the hands of Receiver Ely last week. This is said to be the result of a strike, which has caused the shutting down of the coal mine of the Great Lakes company in the Kaylor coal district.

Canonsburg—All the miners of the Hazel mine, of the Pittsburgh-Buffalo Coal Co., are out on strike. The difficulty involves 500 to 600 men.

The miners have asked that the company pay them for all dead work, such as picking out horseback, clay veins, room turning, cutting off corners, etc. This the company has not been doing, and trouble has thus arisen.

Clinton—A 7-ft. bed of high-grade bituminous coal has been struck about half way between Pembryn and Roaring Branch. It is on the S. & N. Y. R.R., and if everything fulfills expectations there will be mining in that locality before long.

Rossiter—A small strike is in evidence at the Clearfield Bituminous Coal Corporation mine. About 60 men are out and there is no evidence of a compromise.

The trouble has arisen over the taking out of bone. The company wants to employ men by the day to remove the fault while the head men contend that the agreement recently signed in this district guarantees payment by the yard. The matter recently failed of arbitration.

Scottdale—A number of Scottdale men have been at work cleaning up and repairing the damage done by the recent flood of the Lemont mine. Lodging houses have been erected on the grounds and the work has been pushed day and night until now the mine is almost free from the waters of the flood.

An ordinance passed by the town council gives the Baltimore & Ohio R. R. a franchise for the last link of the new low-grade coal road from Somerset field to Garrett, on the main line.

The new line to Garrett will eliminate the dip at Rockwood and the heavy grade to Sand Patch, and will enable one locomotive to haul from 60 to 80 cars.

Virginia

Roanoke—The Black Mountain Coal Land Corporation owns about 35,000 acres of coal land in the Lee County coal field, which is said to be underlaid with a phenomenal stratum of coal. Tests have demonstrated that this coal is of a high grade, far above the average of the world's greatest soft-coal measure, which extends from eastern Kentucky through southwestern Virginia and southern West Virginia, embracing the famous Pocahontas fields of West Virginia.

Washington

Spokane—Stockholders of the Drumheller Land Co. met last week at Spokane and voted to change the name to the Drumheller Coal Co. The company, besides owing large tracts of land, is engaged in developing coal interests at Drumheller, Canada, on the Deer River. A large force of men is at work on the coal land, and it is expected that within 60 days they will be shipping coal to Calgary and other towns of the Dominion.

West Virginia

Charleston—The following appointments for state mine inspectors have been made: J. H. Jackson, Montgommery, W. Va., inspector for the sixth district, and H. H. Pinkney, Dixopoca, W. Va., inspector for the twelfth district.

Mr. Jackson succeeds B. H. Hill, who resigned the inspectorship, which he had held so long and filled so well, in anticipation of becoming the candidate for sheriff of Kanawha County. Mr. Pinkney succeeds P. A. Brady, who assumed the duties of superintendent of the Davy Pocahontas Coal Co.'s mine, one mile from Roadfield, on Spice Creek, July 1.

Unless something definite is done in regard to abolishing the guard system, which is being employed by the Paint Creek coal operators, it would not be surprising to see the entire coal-mining industry of the state tied up. The organizers of the United Mine Workers of America are taking advantage of the Paint Creek situation to effect an organization among the miners. In that case probably 70,000 coal miners will quit work as a protest against the guard system.

E. W. Gaujot, a guard employed by the operators, nearly lost his life at the hands of the miners on the night of Aug. 7. The miners saw he was unarmed and surrounded him, but Gaujot escaped with a severe beating. This incident shows the bad feeling which exists between the miners and the guards.

It is reported that on Aug. 15, 8000 strikers marched into the city and stacked their rifles on the state house lawn. They called on Governor Glasscock, appealing to him to disarm the mine guards.

Wheeling—The Fort Pitt coal mine has been compelled to suspend operations owing to an accident to the engine. Repairs have been completed, however, and the mine has resumed after only an idleness of one day. The company has orders for all the coal it can get out and is making every effort to keep the mine running to its full capacity.

Examinations for mine-foremen and fireboss certificates will be held Aug. 28 and 29, at Wheeling, W. Va.

Germany

WESTPHALIA

Bochum—More recent details regarding the explosion at the Lothringen (Lorraine) shaft at Gerthe, near Bochum, show that 109 dead bodies were recovered (up to and including Aug. 9) 9 other men probably dead were still unfound and 2 men, who were brought alive from the shaft, died that same night.

The explosion is believed to have occurred in a cross-tunnel in the 3rd level; but the actual location is still in doubt and the authorities are reticent and restrict the use of the telephone. The bodies were all badly burned so that recognition was impossible.

A fire is said to have broken out after the explosion occurred, and this hindered the rescue work. Since the Radbod disaster in 1908 which destroyed more lives, no large mine disaster has occurred in Germany.

Industrial News

It is rumored that the National Press Fuel Co., of Indianapolis, desires to erect a $30,000 factory for the manufacture of press fuel in Urbana, Ill. The location is desirable partly because of the wealth of the community and partly because of the city's convenience to the coal mines.

The Lehigh Navigation Electric Co., of Philadelphia, are planning to demonstrate the folly of hauling coal for power purposes instead of transforming the fuel into electricity at the mines. The company is erecting a large power plant at Hauto, Penn., which will be equipped with large Curtis steam turbines for driving powerful electric generators.

A large amount of mine and mining outfits, tools, appliances, etc., are manufactured daily in Ottumwa, Iowa. The American Mining Tool Co. has become widely known in this field. The firm has its factory and offices in its own building, and the entire plant includes half a dozen buildings of varying size.

Publications Received

JOURNAL OF THE CLEVELAND ENGINEERING SOCIETY. July, 1912. Published bimonthly by the Society. 130 pp., 6x9 in., no ill. Price, 35c. a number, $2 per annum.

IGNITION OF GAS BY MINATURE ELECTRIC LAMPS WITH TUNGSTEN FILAMENTS. By H. H. Clark. Technical Paper No. 23. U. S. Bureau of Mines. 5 pp., 6x9 in., two tables, no ill.

New Publications

ADVANCE CHAPTERS FROM MINERAL RESOURCES OF THE UNITED STATES. The Production of Anthracite Coal in 1911. By E. W. Parker. 13 pp.

Fuel Briquetting in 1911. By E. W. Parker. 12 pp.

ADVANCE CHAPTERS FROM BULLETIN 471. U. S. Geological Survey.

Bulletin 471-F: Coal fields of eastern Wyoming. 95 pp., 18 plts., 2 text figs.

Bulletin 471-H: Coal fields in Colorado and New Mexico. 16 pp., 2 plts.

Bulletin 471-J: Miscellaneous Analyses of Coal Samples from various Fields of the United States.

Trade Publications

CHAIN BELT. Concrete Tower Number, August, 1912. Vol. 1, No. 12. 8 pp., 6x9 in., ill. Published by The Chain Belt Co., Milwaukee, Wis.

PERMISSIBLE EXPLOSIVES FOR GASEOUS OR DUSTY COAL MINES. Published by E. I. Du Pont de Nemours Powder Co., Wilmington, Del. 16 pp., 6x9 in., ill.

THE J-M POWER EXPERT. Published in behalf of J-M packings, pipe and boiler coverings, and other power plant necessities by the H. W. Johns-Manville Co., Cleveland, U. S. A. Vol. 3, No. 12. 8 pp., 6x9 in., ill. Mailed free to anyone engaged or interested in this line of work.

THE BURROUGHS ADDING MACHINE FOR COAL AND COKE DEALERS. Issued by the Department of System Service of the Burroughs Adding Machine Co., Detroit, Mich. 16 pp., 9x11 in., ill.

It is a remarkable fact that a large number of the failures in the coal and coke business have been the direct result of lax methods of bookkeeping and the absence of detailed information and system.

The purpose of this folder is to set forth the ways in which some people in this line of business have solved the problem of handling the accounting end of their business most efficiently.

Construction News

Columbus, Ohio—The Hisylvania Coal Co. will soon open a new mine in the Gloucester district. It will be a slope mine and will be electrically operated.

Rockwood, Penn.—The Laurel Hill Valley Coal & Coke Co. is soon to be organized in the upper Turkeyfoot Township. It is reported that 4000 acres of drift heading will be driven at various points.

Larson, Idaho—Directors of the Reindeer Mining Co., which owns the Reindeer mine, have announced that a three-mill assessment on an outstanding capitalization of 750,000 shares will be made for use in development work.

Pardee, Va.—The Meyers & Whaley Co. are installing a loading machine for the Blackwood Coal & Coke Co. This company has a remarkably clean deposit of coal, 10½ ft. thick without parting, which runs through the mountain.

Alverton, Penn.—F. M. Richey, Jr., Robert Norris and A. C. Stickel have bought 10 acres of Connelsville coal and will organize a company to be known as the Stoner Coal Co., capitalized at $30,000. The company will take immediate steps to mine the coal.

Hazelton, Penn.—A new water line to furnish water for the washing of coal on the Yorktown washery is being erected from the No. 6 slope. The new line when completed will do away with the storage dam which has allowed much water to flow back into the mine.

Bridgeport, Ala.—A new firm, known as the Pierce Coal & Lumber Co., has recently been organized in Jackson County. The new company has several mines in operation, their main camp being five miles north of Lime Rock, on the Memphis division of the Southern Ry.

Pottsville, Penn.—The Delaware & Hudson R.R. Co., owner of large tracts of land in Schuylkill County expect soon to construct a line from the southern anthracite region to tidewater. Tentative surveys for the road have already been made. The line will parallel the Lehigh & New England from Tamaqua to Daniellsville, and there it will connect with the New England railroads.

Rock Island, Ill.—It is understood that a company headed by E. C. Walsh, of Davenport, has been organized for the purpose of towing coal from the mines in the vicinity of the Illinois River to the three cities by the way of the I. & M. and the Hennepin Canal. A fleet of vessels and barges has been purchased, according to the report, and active operations will begin in the spring.

Parkersburg, W. Va.—Charter has been granted to the Charleston-Parkersburg Electric Juice Co. Its business will be the manipulation of coal by converting it into electricity for light, heat and power purposes, and to build the necessary terminals for the railway of the Kanawha Ohio Valley Trade Promoting Co. The concern is capitalized at $500,000.

Charleston, S. C.—Plans have been made for the erection of an extensive coal handling plant at Charleston, where every facility will be provided for rapid coaling of vessels.

Arrangements have been made with the Southern Ry., over which company's rails the Clinchfield reaches tidewater, for a rate of $1.40 per ton on coal from the Clinchfield mines destined for coastwise and expert traffic.

Birmingham, Ala.—It looks as if the proposition to establish a barge line to carry coal from the Birmingham district to New Orleans has developed into a practical move and that within a year the line will be put in operation. The Alabama & New Orleans Transportation Co. has announced that a contract has already been given for 15 coal barges to be used for this service, and additional barges will be built later on.

Brazil, Ind.—A company of prominent men is being organized in this city to invest in a large tract of coal land near here and open up a mine as soon as possible. It is rumored that the property and mine belonging to the Richardson Coal Co. will be included in the purchase. Several hundred acres of coal land also will be leased, and it is claimed that the coal to be mined is of an extra good grade of bituminous.

Peoria, Ill.—The coal shaft being sunk by Wm. Grant and his sons at the eastern city limits is now down 60 ft., and as the wrist has been passed, it is believed that the shaft will be completed within a short time. The opening of the shaft is 20x10 ft., and it passes through a 3½-ft. bed of coal. At a depth of about 100 ft., however, a bed at least 5 ft. thick is known to exist. The mine will give employment to a large number of men when it is opened.

Pottsville, Penn.—The Summit Branch Coal Co. expect to spend a half a million dollars in improvements and have awarded contract for the development of their colliery at Lykens. The work is expected to occupy the next two years.

A shaft 1000 ft. deep will first be sunk, and then about a mile and a quarter of tunnels will be driven to tap valuable coal mines. Several hundred more hands will be employed and the capacity will be increased at least 250,000 tons per year.

Midland, Ill.—The Monon R.R. Co. is installing a mammoth coal washing plant and extending its other improvements in this vicinity. The company has expended a vast sum of money in improvements in th coal district and only recently took over several hundred acres of excellent coal land between Midland and Linton. It is said that Midland will be a terminal for all trades over the Victoria & Wallace Junction branch.

A large roundhouse has already been completed, and the laying of over two miles of track has been finished.

Personals

H. C. Van Hoose, of Ashland, Ky., has been appointed assistant mine inspector for the eastern district of Kentucky.

W. L. Moss has been reëlected vice-president and general manager of the Continental Coal Corporation of Chattanooga, Tenn.

A. P. Cameron, for many years superintendent of the mine of Westmoreland Coal Co., at Claridge, Penn., has been appointed superintendent of the Westmoreland coal Co. to succeed E. G. Smith.

H. McKean, who recently resigned the position of superintendent of No. 12 mine of the Tennessee Coal and Iron Co., has returned to Birmingham after a month's absence on a professional trip to Kentucky. Mr. Conner leaves again Aug. 19, on a similar mission in Tennessee.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The public is at last becoming alarmed at the possibility of a hard-coal famine the coming winter and, as a result, the retail demand has opened up somewhat earlier than usual. Many of the operating companies state that the production is covered for the next 60 to 90 days, and are refusing to accept further orders on certain sizes. Domestic is particularly short, with premiums being freely offered, while many of the larger dealers are ready to accept any sizes to be had.

The Eastern bituminous market is firm at spring prices with some grades slightly higher. The companies are anticipating a large business this fall, and mining is now going on freely, but adverse shipping conditions have prevailed due to the lack of motive power; consumers are beginning to appreciate the fact that there is a strong probability of an acute car shortage the coming winter, which is having a further stimulating effect.

The congestion still continues in the Pittsburgh district, with the car supply at the mines rather poor, and there are occasional embargoes being declared on shipments from certain districts; the labor supply is inadequate and there are frequent small strikes at the mines. The manufacturing and retail demand is increasing and production is now probably higher than at any time since the suspension.

In Ohio the car shortage is becoming more pronounced and a number of mines have been subjected to an occasional shutdown. Domestic dealers are buying more and asking for immediate delivery, while there is a marked general improvement in all branches. The labor troubles in West Virginia are having a stimulating effect on the Ohio market and this, together with the car shortage, is expected to result in a general advance in quotations about the first or not later than the middle of September. In West Virginia there is an unusual demand for spot coal, and indications are that prices will soon be higher than for a number of seasons; many companies are declining to enter into any more contracts, and all free coal is being held for higher prices.

There is quite an active demand in the Northwest, and the arrivals are decreasing. Through the Middle West the output is better than usual at this period, and there has been some advance in prices.

Boston, Mass.

Bituminous is firm at the prices established in the spring, and in the case of Pennsylvania grades slight advances have already been realized. The demand for Pocahontas and New River is well up to the output and all grades apparently are now in a strong position for the rest of the year. The bad weather along the coast is having its effect on the market and buyers are therefore more anxious.

All-rail bituminous is in steady request and shipments are up to normal for a good year. The shortage of anthracite all-rail has a tendency to improve the demand for bituminous.

Anthracite supply for this market seems to be getting farther and farther behind. In many places the public has become apprehensive and retail trade is active unusually early. From 50 to 60 per cent. of the orders are for stove size and dealers are getting more than anxious over the outlook. Receipts are small and barges are moving with exasperating slowness. The larger dealers having the most reason for alarm are willing to accept any sizes and kinds that can be had.

Dealers up the rivers see the shipping season slipping by with but a small quota yet received and anthracite generally looks bad in this section. Premiums are being offered for stove and egg and there are almost no shippers who can promise prompt loading except on pea and the buckwheats.

Quotations are about as follows:

Clearfields, f.o.b. mine	$1.10 @ 1.35
Clearfields, f.o.b Philadelphia	2.35 @ 2.60
Somersets, f.o.b. mine	1.25 @ 1.45
Somersets, f.o.b. Philadelphia	2.50 @ 2.70
Pocahontas, New River, f.o.b. Hampton Roads	2.70
Pocahontas, New River, on cars, Boston	3.75 @ 3.85
Pocahontas, New River, on cars Providence	3.60 @ 3.75
Antracite stove, f.o.b. New York	5.20 @ 5.50

New York

Anthracite—There is hardly any change in the anthracite market, except possibly for a further tightening of the situation. Practically everything is now out of the market with the exception of the smaller sizes, which are still rather heavy. Some conservative members of the trade are not hesitating to predict that the domestic grades will be bringing a premium of $1 by the middle of October.

It is stated that the retailers have issued a call to the different members of the trade for a meeting to be held for the purpose of taking steps to obtain a larger tonnage at this point. Such a procedure, however, is not regarded seriously by the operating companies who do not believe it can be productive of any material results.

We continue previous quotations as follows:

	Upper Ports	Lower Ports
Broken	$4.90	$4.50 @ 4.90
Egg	5.15	5.05 @ 5.10
Stove	5.15	5.10 @ 5.20
Nut	5.40	5.20 @ 5.35
Pea	3.50	3.30 @ 3.45
Buckwheat	2.75	2.15 @ 2.55
Rice	2.25	1.75 @ 1.95
Barley	1.75	1.60 @ 1.70

Bituminous—There is a noticeably better ordering of bituminous all along the line and the good grades are becoming somewhat shorter. The demand at tidewater still continues rather slow, but supplies are at a low point and there is no pressure on quotations. There has been a shortage of equipment reported on both the Pennsylvania and the B. & O. R.R., and it is stated at the mines that the labor supply is inadequate.

It is rumored that Pocahontas prices will be advanced to $2.70 beginning the first of next month, due principally to the heavy demand for this grade in the Middle Western markets. Some conservative members of the trade believe that the middle of October will see soft coal quoted in this market at $1.50 f.o.b. the mines.

There was a slight advance in quotations during the week, and prices are now comparatively firm, as follows:

West Virginia, steam	$2.35
Ordinary grades Pennsylvania	2.45
Fair grades, Pennsylvania	2.60@2.70
Good grades, Pennsylvania	2.75@2.80
Best Miller, Pennsylvania	2.95@3.00
Georges Creek	3.15

Pittsburgh, Penn.

Bituminous—Congestion in the Lake coal movement continues. Occasional embargoes have been placed on shipments from some districts to certain docks, and railroad yards generally are rather crowded, while the car supply at the mines is hardly satisfactory. The labor supply continues scant, and small strikes frequently occur. Despite all the drawbacks, however, coal production is heavy, and nearer to capacity than at any time since the suspension, if not for a longer period. Demand from manufacturers and retailers has improved somewhat; in both cases it is accelerated by the certain prospects of a serious car shortage this fall.

Prices are perhaps a trifle firmer. We repeat former quotations, but note that they are being more generally maintained: Mine-run and nut, $1@1.05; ¾-in., $1.25; 1¼-in., $1.35; slack, 50c., per ton at mine, Pittsburgh district.

Connellsville Coke—The long deadlock on furnace-coke contracts for the balance of the year is now entirely broken, some half dozen contracts having been closed in the past ten days at $2.25, involving a total of 25,000 or 30,000 tons a month for the remainder of the year. The first contracting was in the East, where representatives of the Producers' Coke Co., which now handles the output of many of the operators who originally were holding out for $2.50, made a tour of the district and undertook to explain their new position.

Sales of prompt and August coke have been fairly heavy, reaching 25,000 tons or more, at $2.25 and $2.30, chiefly the former figure, and consumers are now well covered for August, with a number not covered for September and later, which should bring in a fresh demand within a fortnight. All reports are that additional furnaces will be blown in shortly, and producers insist that if consumption is thus increased prices will advance sharply. Many operators are unwilling to sell any furnace coke at all at $2.25 or $2.30. We quote: Prompt furnace, $2.25@2.30; contract furnace, $2.25@2.35; prompt foundry, $2.40@2.50; contract foundry, $2.40@2.75, per ton at ovens, Connellsville region.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Aug. 10 at 385,967 tons, an increase of 7000 tons, and shipments at 4208 cars to Pittsburgh, 6161 cars to points West and 1082 cars to points East, a total of 11,451 cars, an increase of 82 cars.

Philadelphia, Penn.

The pressure in the market for anthracite coal still continues. It has practically reached the stage now when orders for certain sizes are being turned down with the statement that the companies are completely filled up with orders, sufficient to cover the production for the next 60 or 90 days. All sizes coming under the head of domestic, are in short supply, and premiums of anywhere from 15 to 25c. per ton are now being offered for prompt shipments.

The advanced price of chestnut is commencing to show in the increased demand for stove. The object which the companies endeavored to bring about has been accomplished, that of diverting some of the demand for chestnut on to stove, but the result has been greater than expected; whether the remedy for this will be an increase in the price of stove, remains to be seen.

The fact that the market, even under the most favorable conditions, will be short from 7 to 8 million tons, when compared with last year, is evidence that there will be strenuous times in the anthracite trade this fall. No one locality, even at this season, appears to be satisfied with the quantity of coal they are receiving. It is fair to presume that the proportion allotted to each is as much as the companies can spare, and it would only be by deliberately passing others by, that any one locality could receive its full requirements.

The week just passed has shown but little betterment in the bituminous situation, but on the other hand, there has been no retrograde movement. What little improvement was shown, continues to make itself evident, but prices and demand still continue as last noted.

Baltimore, Md.

Adverse shipping conditions have prevailed here, due to the shortage of motive power on the railroads. Coal has been freely mined, but many of the shipments consigned to coastwise points arrived one and two days late, and unless conditions improve during the coming week, operators say that many complaints will be registered.

On top of the apparent inadequate supply of motive power comes the fear of a possible car shortage during the fall. There will probably be a good demand for coal during September, October and November, and unless the railroads take steps to increase their car supply, they will not begin to be able to make prompt deliveries.

An extremely bullish feeling seems to prevail among local coal men, and while not much new business is being booked at this time, all feel confident that the large consumers will shortly enter the market and that the renewed activity in all lines of business is going to bring prosperous times for the coal operators.

Prices have not changed much in the past ten days or two weeks. The coke market does not show much activity; a few inquiries were reported, but they have not as yet developed into actual business.

Buffalo, N. Y.

The demand for bituminous continues to show improvement. Consumers are beginning to appreciate the fact that cars are becoming scarce and that the trouble from this source is likely to grow more severe as the year advances. Mining in certain sections has been carried on under difficulties because the railroads did not have cars to move the coal. Steel hoppers are less plentiful, while gondolas have been scarce for weeks.

The shippers are keeping their customers warned of the situation and expect to see results in additional orders; they also look for better prices. Indications are for very brisk business within a couple of months and a more noticeable lack of cars, particularly on the Canadian roads, although the Grand Trunk is now moving coal much more expeditiously than three weeks ago.

Pittsburgh quotations are unchanged, but show more firmness at $2.57½ for three-quarter, $2.47½ for mine-run and $2 for slack, with Alleghany Valley sizes about 25c. lower. The prediction is made that slack will be selling as high as mine-run before many weeks, and it is gaining in strength.

The anthracite situation shows little or no change. Everywhere retailers report a very small amount on hand and many of them have had orders in for months which are still unfilled. Shipments of anthracite by Lake were not as large last week as in the week before, the total being 135,647 tons.

Columbus, Ohio

There has been a marked improvement during the past week in practically every branch of the industry. There is a better demand for the domestic grades, the Lake trade is continuing active and steam sizes are showing a fair improvement.

One of the best features is the better domestic orders; dealers are now buying more and are asking for immediate delivery. The demand from householders is growing better and the school business is still hanging on, although the larger part is over. There is a good demand for the better grades of domestic coal, such as Pocahontas and the splints, and dealers are stocking considerable of those varieties.

There is an increased car shortage and a number of mines in the Hocking Valley as well as eastern Ohio have been compelled to close down for a portion of the past week. With the coming of the car shortage and the closing down of many operations in West Virginia, due to labor troubles, the price list is growing firmer in all districts. It is believed there will be an increase of about 15c. on domestic and three-quarter inch the first, or not later than the middle of September. There is a much better feeling in manufacturing circles, and the iron and steel industry especially shows a decided improvement. The Lake trade remains active in the extreme, although there is considerable congestion reported on the docks at the upper Lake ports. Chartering of boats is going on and there is every indication that the Lake trade will continue active until the close of navigation.

Quotations in the Ohio fields are:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50		$1.50	$1.50
¾-in.	1.35	$1.15	1.35	1.30
Nut	1.10		1.20	
Mine-run	1.15	1.00	1.15	1.05
Nut, pea and slack	0.50		0.55	0.40
Coarse slack	0.40	0.45	0.35	0.30

The retail business is growing more active and many of the larger users have placed their orders with the dealers.

Hampton Roads, Va.

On account of the strength of the market now at Hampton Roads, shippers may safely assume a more independent attitude. There appears to be an unusual demand for spot coal and should this continue, as indications now are, coal will be bringing more at Hampton Roads this fall than it has for a number of seasons. Many shippers, particularly of smokeless, are already declining to enter into any more contracts. Whatever free tonnage is to be had will be retained to take advantage of the practically assured higher prices later on.

Shippers are more or less handicapped on account of the limited car supply, a condition quite uncommon at this time of the year. As a result of the heavy demand for Hampton Roads coals and the decreased loading, caused by the inadequate car service, no one is now able to accumulate any extra coal. Tonnage is already chartered for coal to be taken as far in advance as the middle of September.

Vessel rates to New England have been advanced 5 to 15c. during the past 30 days. Shippers who are in the market for tonnage for South American and Mediterranean ports are also confronted with higher rates than they were a few weeks ago. It is predicted that the Hampton Roads coal market will undergo a decided change by the first of September.

Charleston, W. Va.

Despite the fact that there has been a strike in the Kanawha district, the output along the Chesapeake & Ohio was greater in July than in June. The demand for coal is strong, and the prices are holding up. Demand for slack is greater than ever known in the history of the coal industry in this state; usually during the summer months slack has been a troublesome proposition, but such is not the case this season. The price has not been below 50c. at the mines, and as high as 80c. has been paid. Kanawha mine-run is bringing from 85 to 95c., while lump is picking up on account of the improvement in the domestic trade and is quoted at from $1.40 to $1.65 at the mines.

Memphis, Tenn.

The trade at Memphis has been at a standstill for the past two months. The wholesale market is dull, with prices ruling quite low; the continuous hot weather throughout the Memphis territory, together with the poor condition of the cotton crop, has seriously affected business generally in this district.

The West Kentucky prices continue rather low and weak, as follows: No. 1 screened lump, $1@1.10; nut, 95c.@$1.05; mine-run, 80@90c. These prices have been effective for some time, and there is no immediate indication of any change taking place.

The product from the East Kentucky and Tennessee mines is in fairly good demand, especially on the domestic sizes. The Alabama coals are in heavy demand, particularly for domestic, with prices ruling about as follows: Cahaba Block, for August shipment, $2.75@2.85; Carbon Hill Block, $1.75@1.85; screened nut, $1.35@1.50; mine-run, $1.15@1.25.

Nashville, Tenn.

While prices are not any too good, they are better than they were this time last year, and the indications are that for the next two months business will be quite good; after that time it will be purely and simply a weather market, as far as applying to domestic coal.

There has been some little evidence of a shortage of cars on the L. & N. R.R. Whether this means that they are going to be short of equipment this fall or have simply been derelict in getting same together, is not evident; there is some apprehension on this score, because of the bad service received during the busy season last year.

There is little improvement in steam-coal business, and prices have not advanced. Screenings are a little weak, as they always are when domestic coal commences to move.

Indianapolis, Ind.

There is apparently no reason for discouragement in the coal-mining industry in this state. The mines are generally employed and the output is far better than usual at this time last year.

Dealers say that hard coal will be hard to get this coming season, and in the principal cities of the state the outlook for obtaining a supply is so discouraging that some have refused to contract with their customers. Leading dealers believe that by October the anthracite shortage in Indiana will be astonishing. This, of course, will stimulate the soft-coal trade.

The second midsummer advance in coal prices has been made. The raise in July carried prices up 25c. a ton generally, and the August raise adds 25c. to 50c. more to the price, making it close to the usual midwinter schedule.

Dealers say their excuse is a corresponding advance at the mines, a shortage of coal mined on account of spring shut down and a scarcity of cars due to the grain crop now being moved.

Detroit, Mich.

Bituminous—There is a very active demand for all sizes in steam coal and the incoming supply is decreasing each day. Some of the consumers do not seem to take this seriously and are not using any precaution in stocking up. This may be due to the fact, however, that they have no room to handle coal in very large quantities.

In some cases it is just the reverse, and they are stocking beyond their requirements. A few very large contracts were closed this week, but these were principally for the smaller sizes.

Railroad managers in Detroit are preparing for another car shortage during the fall and winter. They expect it will come, but are doing everything in their power to make it as light as possible. An appeal has been sent out by the railroads, asking all shippers and consignees to aid by loading and unloading the cars of coal delivered to them as expeditiously as possible.

The local market prices are as follows, f.o.b. mines:

	W.Va.	Smokeless	Pittsburg	Hocking
Domestic lump	$1.75			$1.50
Lump and egg		$2.50		
¾ lump	1.25		$1.15	
Washed egg				1.80
Washed nut				1.65
Mine-run	1.00	1.25	1.05	
Slack		1.05	0.85	

Anthracite—The scarcity in this article still continues and it is now out of the question to close a contract at any price. This coal will advance from 50c. to $1 on all sizes Sept. 1.

Coke—This is becoming a little scarce again. However, there is no great demand, as everyone seems to be well supplied. Connellsville is quoted at $4.85, Semet Solvay at $5 and gas house at $4.75, f.o.b. Detroit.

Chicago

Screenings are 10c. higher than they were a year ago and the slump, usual at this time, has had no appreciable effect.

A shortage of Illinois Central cars is a cause for complaint on the part of a number of operators. That a car shortage will be general within the next 60 days is regarded as certain. Reports from Franklin County are to the effect that its mines are working at about capacity; collections are reported as good. The condition of the coke market is exceptionally satisfactory. Heavy orders are reported by sales managers handling smokeless coal.

Prevailing prices at Chicago are:

	Sullivan Co.	Springfield	Clinton	W.Va.
4-in. lump	$2.47			
Domestic lump		$2.17	$2.27	
Egg	2.37			
Steam lump		1.87	2.12	4.05
Mine run	1.99½	1.82	1.92	3.30
Screenings	1.72	1.33	1.67	

Coke—Prices asked for coke are: Connellsville, $5@5.10; Wise County, $4.85@5; byproduct, egg and stove, $4.75; byproduct, nut, $4.60; gas house, $4.50.

St. Louis, Mo.

The past week has brought about some change in the local market in the way of better prices on the higher-grade coals. Carterville nut coal has been selling as low as 90c. at the mines, and screenings went down to 50c., but it was just temporarily on the screenings, and they are

now back at about 65c. The Standard market is in a deplorable condition, the operators getting only about 85 to 90c. for lump coal and 60 to 65c. for screenings.

Almost a similar condition exists in the Carterville field, while Franklin County is enabled to get a higher price for all their sizes, and the Mount Olive district operators know what their coal costs them and insist upon getting a fair margin of profit, or leaving it in the ground.

Business in general is picking up both in city and country. It is impossible to get anthracite coal in the St. Louis market, and coke is also at a premium. During the past week Carterville No. 2 washed sold as low as $1 and No. 5 washed as low as 40c.

The prevailing prices are:

Franklin County	
Lump and egg	$1.40@1.60
No. 1 nut	1.25@1.30
No. 2 nut	1.15@1.25
No. 3 nut	0.95@1.05
2-in. Screening	0.65@0.75
Mine-run	1.10@1.20
Carterville	
Lump	$1.35@1.50
Egg	1.25@1.40
Nut	1.00@1.15
Screenings	0.50@0.60
Mine-run	1.05@1.10
No. 1 washed	1.40@1.50
No. 2 washed	1.10@1.20
No. 3 washed	0.80@0.90
No. 4 washed	0.75@0.85
No. 5 washed	0.50@0.60
Mount Olive	
6-in. lump	$1.35@1.40
2-in. lump	1.25@1.30
Screenings	0.50@0.60
Standard	
6-in. lump	$1.00@1.05
2-in. lump	0.85@0.95
Screenings	0.55@0.65

Anthracite prices prevailing here are the September circular, which are: Chestnut, $7.45; egg and stove, $7.20; grate, $6.95. Byproduct coke is $4.75 with gas house, $4.65.

Portland, Ore.

While several vessels have been chartered to carry coal from Australia to San Francisco this fall, none have so far been fixed for Portland, and indications now are that few, if any cargoes, will come here from that point. Importers here say that freight rates are too high to justify any importations at this time, especially since there is considerable Australian coal on hand from last season.

Weather conditions are more favorable to the coal dealer now than a few weeks ago. Consumers are also beginning to put in winter supplies and this is accelerating the movements. Considerable low-grade coal is being introduced and meeting with some demand.

Production and Transportation Statistics

Virginia Railways

Total shipments of coal over this road for June of the current year were 256,070 net tons as compared with 311,247 for the month previous.

Norfolk & Western Ry.

The following is a statement of tonnages shipped over this road from mines in West Virginia for the month of July in short tons:

Field	Tipple Coal	Total Coal
Pocahontas	18,166	1,304,717
Tug River	5,154	210,205
Thacker	4,114	227,595
Kenova	7,458	79,300
	34,892	1,821,817

Shipments of coke originating entirely from the Pocahontas field amounted to 81,153.

The following is a statement of commercial and company coal shipped from mines on the N. & W. Ry. during July of the current year in short tons:

Field	Commercial	Company
Pocahontas	1,266,364	85,265
Tug River	175,285	34,920
Thacker	171,088	56,507
Kenova	70,352	8,948
Clinch Valley	124,348	6,173
Total	1,807,437	191,813

Chesapeake & Ohio Ry.

The following is a comparative statement of the coal and coke traffic over the lines of the C. & O. Ry. for June 1911-12, and for the 12 months ending June 30, 1912, in short tons:

	June		
Destination	1911	1912	12 months
Tidewater	302,283	307,023	4,324,397
East	123,371	152,020	2,164,960
West	871,340	1,074,797	11,105,871
Total	296,994	1,533,840	17,595,228
Coke	15,852	20,811	236,518
From Connections			
Bituminous	13,973	16,578	214,703
Anthracite	2,013	1,673	35,228

Foreign Markets

Austria

The production of Austria (without Hungary) for the first half year of 1912 amounted to 7,718,524 metric tons of coal, 12,747,064 tons of lignite, 1,115,561 tons of coke and 199,181 tons of coal and lignite briquettes.

Spanish Imports

Spanish imports for five months ended May 31 were as follows, in metric tons:

	1911	1912
Coal	869,202	883,372
Coke	129,087	169,516

Oriental Markets

JAPAN—This market has again been dull, and there is little change to report since last writing; there is still a certain amount of enquiry but no actual business worth speaking of has been put through as freights are still too high. Stocks on the spot are about up to the average, but in Japan shipping ports they have decreased considerably and prices over there are firm.

CARDIFF—Deliveries have been unusually heavy the last fortnight.

MANCHURIA—A fair business has been done at staple quotations. Stocks at the pit-head are increasing owing to the difficulty in securing tonnage and the high freights ruling.

KAIPING—Since our last issue the amalgamation of Kaiping and Lanchow Mining Companies has become an accomplished fact under the designation Kailan mining administration. The local agent of the late Chinese Engineering & Mining Co., Ltd., remains the agent of the new concern at Shanghai.

The combined shafts give them a very big output, and they will no doubt enlarge their business on the China coast. Present prices remain unchanged, although firm, owing to the continued increase in freight rates.

Financial Notes

Paint Creek Collieries Co.—Wilkes-Barre and Scranton brokers are dealing in this company's 5%, 50-year, first mortgage and sinking fund gold bonds dated 1906 and due Jan. 1, 1956, but redeemable at $105 and interest.

Milburn Coal & Coke Co. — This company is offering at par and interest $150,000 6% coupon notes of $1000 each, dated Dec. 1, 1911, and due $25,000 quarterly June 1, 1912, to Sept. 1, 1913. The notes are guaranteed jointly and severally by the directors.

O'Gara Coal Co.—This company's surplus for the year of 1911 amounted to $283,810, of which $95,923 was applied to improvements and additions and $187,887 to retirement of liabilities. The company expects higher prices during the current year which will add materially to profits.

New River Co.—President Robert H. Gross, at the hearing on June, 24 submitted affidavits showing that stockholders representing about 190,000 of the 290,000 outstanding shares of this company were opposed to the appointment of receivers, and that the creditors representing about $125,000 of the $180,000 claims against the company were also opposed.

Reading Co.—For the eleven months ended May 31, this company had earnings, after additions and betterments and full preferred dividends for the year, of $4,383,652 compared with $4,509,111 for the same period last year. This equals 6.26% against 6.45% a year ago. In June of last year about $625,000 surplus was reported. This will be exceeded this year, but on a liberal estimate will fall short of $1,000,000 for the month, giving 7.6% for the common after preferred dividends and additions and betterments.

Island Creek Coal Co.—With share profits of only $2.34 last year on the common, some surprise was expressed at the high dividend rate recently announced by the board of directors of this company. The answer is that Island Creek actually earned last year about $4 per share, but charged the difference into construction. Also share profits this year are expected to cross the $5 mark, and with an increase in production next year to 2,500,000 tons, the company should earn about $7 per share.

Colorado Fuel & Iron Co.—The geographical position of this company is such that it is practically immune from severe competition on the part of the great Eastern steel companies and its natural resources are very large. It has now proved, by diamond drills, from 20 to 30 years' supply of ore on the basis of a 2,000,000 tons a year consumption. Benjamin S. Bush, now president of the Missouri Pacific R.R., at one time estimated that the company's coal reserves were alone sufficient to secure the entire outstanding funded debt.